The Chemical Age

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Organised Scientific Research

THE thing that is really going to make a difference in the future . . . is the command for industrial purposes which man has over the forces of nature. With these words, taken from an address delivered by the Earl of Balfour in 1919, the Department of Industrial and Scientific Research aptly opens its report for 1934-35. The report is full of evidence of valuable work completed, or of potentially valuable work in progress. For the general industrialist and the business man, perhaps the most significant portion is to be found in the report of the Advisory Council signed by Lord Rutherford, in which the case for organised research is powerfully stated, and comforting evidence is given of the growth of the movement. The Board is "by no means disappointed" with the evidence it has of the growing realisation of the importance of applying at every state in the processes of industry, the help that science can afford; and it believes that prosperity will only be restored when industry is prepared to carry the knowledge gained by research to a further stage and apply it to meet daily needs. Although most or all of the larger concerns are fully aware of the need for applying science, some of these firms do not put their convictions into the fullest practical application, and there are many, especially of the smaller and older concerns, that do not take notice of what is going on around them. It will be remembered that the conclusion reached by the body of chemists who independently investigated conditions on the North-East coast was one of neglected opportunities to develop new industries and of failure to realise that the progress made by industrial competitors elsewhere was securely based on the scientific organisation of industrial processes.

Behind the council's report is the urgent advice to all firms to scrap old-fashioned rule-of-thumb methods and to replace them by modern scientific methods. It is those firms that apply the scientific method to their daily processes that will be capable of applying advances in knowledge as they are made. This is no mere faddist's advice; it concerns not only the welfare but, as has been shown in the case of the depressed areas, the very existence of the concerns themselves and the country as a whole. The council states, whilst it has encouraging evidence of changes in the right direction, "that much remains to be done is only too evident, and it is important to remember that *we cannot afford to lose any time.*" Certain industries were specifically investigated from this point of view and it was found that, compared with their industrial rivals overseas, the scientific outlook of these industries still leaves much to be desired. *Neither in the directorates nor among the technical and executive staffs is sufficient weight yet given to scientific attainment and experience.* Again the council emphasises that "time is not on our side. The fact that this country has succeeded better than some others in raising herself by her own efforts from the economic depression gives her, momentarily perhaps, an opportunity of recovering some of the industrial supremacy she enjoyed until the great war. If the opportunity is to be seized it will require an intensive application of scientific methods to all our industries." The moral is not for the areas of industrial depression alone. The chemical industry, being based on science, is probably as a whole less behind-hand than any other in the country; but chemists should take every opportunity of bringing these facts to the attention of their own directors and of both those from whom they purchase materials and those to whom they supply chemical products.

Fortunately, the evidence of increased zeal for research, and in particular for organised research, with which the council is primarily concerned, is encouraging. The offer of increased financial support which the Government made to the industries represented by the research associations already formed has been accepted by the majority. During the last two years negotiations have been completed with 13 research associations with the immediate result that these bodies are already assured of a 30 per cent. increase in their resources compared with those they commanded 18 months ago. All save one of these associations has an income of not less than £10,000 a year, whilst some of the more fortunate can speak of incomes of £31,000, £64,000, and £75,000 a year. What is done by the research associations and the bodies working directly under the council is not the sum of the industrial research pursued in the country. To give only one instance, the gas industry has no official or organised association working under a grant from the Department, but that industry spends in research a sum annually that cannot be far short of the £64,000 mentioned as the income of the Electrical Research Association—it is, however, contributed privately and is not partly contributed by the Government. There is, perhaps, a moral here; the chemical industry also spends vast sums—as witness the £1,000,000 of Imperial Chemical Industries on hydrogenation research—but without Government grant. Research associations partly supported by the nation are highly commendable, but those industries which do not need the spur of "grants" to cause them to initiate research appear to us to be the more worthy of commendation.

Notes and Comments

The Chemist and the Chef

CHEMICAL science is playing a constantly increasing part in food production, but there is one sphere it has not yet mastered. Until we have a better appreciation of the chemical reactions of the palate the chef with his training must be the final arbiter in that connection. Taste is still outside the possibility of reference to scientific data. Dr. L. H. Lampitt, chief chemist of J. Lyons and Co., Ltd., and chairman of the Food Group of the Society of Chemical Industry, made this confession in his lecture to the Royal Society of Arts on "Food and the World" last week, but he visualised the possibility of the ultimate reduction of a flavour to a formula. Science, however, has the one great achievement to its credit of having proved the fears of a food shortage that existed a few years ago to be nothing but a bugbear, and of demonstrating that the bad old days of Good Queen Bess, with their starving multitudes, and the days of Queen Victoria, with their thousands of starved men and women, need not obtain in 1936. Knowledge of the science of food is being developed under the authority of a large number of organisations with many varied objects. Every civilised or partly civilised nation now has its food investigation scheme. Scientists apply their influence and knowledge in a number of ways in the improvement of yield, in methods of food preparation, methods of baking and cooking in general, by studies of the effect of micro-organisms on food, in methods of packing and wrapping and avoidance of food spoilage and, finally, in the study of vitamins and salts and of nutrition. The Food Group, formed only five years ago, has now reached a membership of 350, representing more than $7\frac{1}{2}$ per cent. of the entire Society of Chemical Industry.

An Index to Trade Recovery

THE gas industry's yearly statistics are a useful guide to the state of trade in this country. When times are bad and factories are closed down or not working fully, the sales of gas to industry are low, rising as industrial prosperity returns. The marked increase in the past year in the industrial sales of gas is, therefore, a reliable pointer to better times ahead. It not only shows which industrial centres have been quickest to shake off the depression, but affords evidence of the movement of trade from one district to another. In 1934 56 per cent. of the gas sold in Sheffield was bought for industrial purposes, and last year the percentage rose to 62. Rotherham shows equally striking figures, while increases in the amount of gas taken by industries in almost every important Lancashire town reflect the healthier condition of that county's trades. Coventry shows a rise from 30 to 35 per cent. and Derby from 28 to 35 per cent. Industries in Stoke-on-Trent and the Potteries, West Bromwich, Smethwick, Leicester and Wolverhampton bought last year a fifth or more of the total gas sold. A sharp rise in the industrial sales of many gas undertakings in or near London shows that the trend of industry southward continues. In the areas served by the Watford and Maidstone gas undertakings the proportion of sales for industrial purposes last year was approximately double the 1934 figure, rising from 9 to 17 per cent. respectively. At Slough the percentage rose from 28 to 32, while the two largest gas undertakings in London disposed of almost one-tenth of their total sales to trades of various kinds, and one-fifth of the sales of a third London undertaking now go to industry.

Procter Memorial Appeal

THE passing of Professor H. R. Procter, F.R.S., in August, 1927, marked the close of the first chapter in the application of science to the leather industry. He was one of the founders of the International Society of Leather Trades Chemists and served in every office, as president, honorary president, honorary secretary and editor of journal. On retirement from the chair of the leather industries department at Leeds University, the Procter International Research Laboratory adjoining the leather department was erected by a few friends and members of the industry as some acknowledgment of his services. The amount subscribed was only sufficient to build and equip the laboratory, and unfortunately no endowment is available to finance suitable workers. A memorial fund is now being established under the auspices of the International Society of Leather Trades Chemists with the object of perpetuating Procter's name by the foundation of a memorial scholarship to be awarded annually. In is intended that the scholarship holders shall work on research of a fundamental character in the Procter Laboratory. Leeds University will be responsible for the administration of the fund, and the Worshipful Company of Leathersellers has agreed to act as treasurers. It is suggested that the memorial fund might be augmented by bequests and that when the income is of sufficient dimensions a Procter Research Fellowship should supersede the scholarship.

Lack of Scientific Outlook

IF there were more chemists—more men with the scientific outlook—in Parliament, and public life generally, we might be a great deal happier. Dr. E. F. Armstrong stressed this point in his lecture to the Society of Chemical Industry last year, and Mr. L. A. Munro, of Imperial Chemical Industries, expressed similar views in his recent talk to the Chartered Institute of Secretaries. We need look no further than the new Poisons Rules and the disappointment expressed a fortnight ago in these columns by the British Association of Chemists at the absence of recognition of its members' qualifications for evidence of the lack of scientific outlook. The need exists not only in this country, but across the Atlantic too. During the last few years in America there have been some interesting controversies involving basic principles which sooner or later the chemical industry must face. For instance, in the Distillers' Code the source of potable alcohol was specifically limited to American agricultural raw materials. Again, in the case of wood chemicals, the issue was sharply divided between the natural and synthetic products. On the assumption that the former employed more labour and was entitled to preferential treatment, proposals were made in some cases to set up special equalisation taxation in order to allow the older industries to compete with the newer. Why should a new enterprise be penalised by special taxation designed to create employment?

Fluorescent Indicators

By Dr. JULIUS GRANT, F.I.C.

NOW that certain "teething troubles" have been overcome it may be stated safely that the use of the fluorescence of certain substances in ultra-violet light is firmly established as an aid to analysis. The more spectacular achievements of the method and their application to various branches of science and industry are now well-known, but certain less assuming branches of the subject have received little attention. Some of the phenomena which may be said to have given birth to the analytical application of the method have proved to be the precursors of one of the most useful of these branches, and it is the purpose of this article to draw atention to some of its applications.

The phenomenon referred to is the change, with varying *p*H values, in the nature of the fluorescence of a solution of quinine in the presence of certain acids, notably sulphuric acid. It was pointed out some years back that this change may be used to indicate the end-point of an acid-alkali titration involving an acid which produces a fluorescent salt with quinine, and it was found that the sensitiveness was very much greater than that obtained when an ordinary indicator was used; under suitable conditions the writer has been able to titrate 10^{-5} *N* sulphuric acid and ammonia in this way, and this is not surprising in view of the fact that the fluorescence of quinine sulphate is visible in concentrations of 1 in 10^{8} (Grant and Procter-Smith, "Analyst," 1934, *59*, 749).

Advantage of Fluorescent Methods

The advantages of the method are not confined to the fact that it may be used for such very dilute solutions; indeed, beyond a certain point this sensitiveness may have no real significance, because the minimum size of the drop delivered from the burette sets the limit of accuracy in volumetric work, although, of course, the use of special micro-apparatus increases the precision obtainable in this direction. One of the most signficant advantages is the fact that the method may be used with coloured or turbid colutions in which the end-point obtained from an ordinary indicator would be badly masked. Examples of such liquors (which defied all the ordinary methods of volumetric analysis) are mentioned below, and in some cases, owing to the presence of suspended matter and electrode poisons, electrolytic (*i.e.*, potentiometric or conductometric) titration also failed.

Yet another advantage which may be of signifiance in certain cases, is the elimination of the usual error inherent in the use of indicators. Since, for example, an indicator itself has the properties of a weak acid or base it will use up some of the alkali or acid present, respectively, and so introduce an error, the magnitude of which depends on the amount of indicator present. This type of indicator error is well-known in another form in connection with the determination of *p*H values of badly-buffered liquids, *e.g.*, distilled water. Although flourescent indicators exert their effects by combination with one of the reactants of a titration they are used in such very minute quantities that the error introduced is negligible. It is apparent, therefore, that while no case exists for the universal substitution of ordinary indicators by fluorescent indicators, there is frequently a good deal to be gained in certain instances by keeping them as a second string to the bow.

Apparatus and Technique

The method does not involve the use of any special apparatus or technique, although a few hints may be of assistance in enabling the best results to be obtained with a minimum wasted effort. A source of ultro-violet light is, of course, essential, and there are few modern laboratories which do not possess one. The make and type are unimportant, and a carbon arc may be removed by suitable filters. The only point is that the source of light should radiate horizontally, so that the titrating-vessel may be illuminated, and this narrows somewhat the choice of the design of the lamp.

The best results are obtained in a darkened room, and this is a point worth insisting upon. There is no difficulty in working by the filtered light from a mercury arc, and several devices make it possible to read the meniscus of the burette under such conditions. One is the fluorescent float described by the writer ("Fluorescence Analysis in Ultra-Violet Light," 1935) which contains quinine sulphate and which enables an accuracy of one drop to be obtained. A smear of vaseline on the graduations of the burette, or a speck of quinine sulphate on the surface of the liquid may also be used for the same purpose. The best type of titrating vessel is a quartz Erlenmeyer flask (because glass absorbs ultra-violet light); if this is not available and a glass flask is used, the walls should be as thin as is reasonably possible, and the glass should be non-fluorescent. Many workers (including the writer) prefer, when practicable, to use a glass or porcelain dish which may be illuminaated from above, and any fluorescence due to the container is thereby minimised.

pH Indicators

It is now proposed to indicate in the briefest outline the type of work which may be carried out with the aid of fluorescent indicators.

It is a well-known fact that the intensity of fluorescence of a solution depends on the *p*H value, and it has been found that *p*H-intensity curves are obtainable, which are characteristic of a particular substance or structure. The work of H. Fink and W. Hoerburger ("Zeit. physiol. Chem.," 1934, *225*, 49; 1935, *232*, 28), which sheds a valuable light on the structure of the porphyrins, may be cited as an example. Conversely, the intensity of the fluorescence of a particular substance may be used to indicate the *p*H value. The *p*H ranges corresponding with changes in the colour and/or intensity of the fluorescence of some 50 "indicators" are now known, and if chosen discriminately these substances are a useful aid in the determnation of *pH* values of coloured or turbid liquors.

Examples with their corresponding optimum *p*H values are benzoflavine (1.0), eosin (3.5), erythrosin (4.3), 3-6-dihydroxy-xanthone (6.6), umbelliferone (7.0), acridine orange (9.5), coumarin (11.0), and the naphthionic acids (12.5). It will be noted that quinine is not included, the reason being that there is evidence that the specific action of the acid ion on the fluorescence is of importance here as well as the *p*H value. The fluorescence of quinine is, however, sometimes used to determine the correct *p*H value of the end-point of an indicator.

Acid-Alkali Titrations

In acid-alkali titrations the indicator is added to the liquor being titrated, and the large number of indicators now available makes it possible to select one which will correspond with the *p*H of the desired end-point. A great deal of work has been carried out on the application of this method to the titration of the acidity of coloured wines, amino compounds, beer, etc. (cf. L. Colombier, "Ann. Falsif.," 1931, *24*, 89; J. Eisenbrand, "Pharm. Ztg.," 1930, *75*, 1033, etc.).

In certain cases investigated by the writer (*e.g.*, caramels, caustic soda recovery liquor, dark beers, etc.), the method apparently fails, because the fluorescence of the indicator is masked or inhibited by the colour of the solution. The writer has found that this difficulty may, however, be overcome quite simply if the liquid can be made to froth, either naturally (by simple agitation) or artificially (*e.g.*, by the addition

of a trace of saponin). A little quinine or other suitable indicator is added, and when the titration is carried out the change in the fluorescence of the froth provides the necessary end-point. Powdered solid indicator, which is entrained in the froth, may also be used, and in some cases is advantageous.

Work on ionisation constants is due chiefly to J. Eisenbrand ("Zeit. phys. Chem.," 1929, *144*, 441; and *loc. cit.*) who devised an apparatus to eliminate apparent anomalies such as those due to the absorption of the fluorescent light by the solution in which it is produced. He was thus able to determine the ionisation constants of substances such as quinine sulphate and β-naphthol from the formula 0.01 *A* (OH)/-(1-0.01)*A* where (OH) is the hydroxyl ion concentration and *A* the intensity of the fluorescence. The results were in agreement with those obtained by other methods. R. Kuhn and G. Moruzzi ("Ber.," 1934, *67 B*, 888) carried out work on similar lines with the flavines.

Precipitation Reactions

The value of adsorption indicators for sharpening the end-point of precipitation reactions (*e.g.*, between silver nitrate and a chloride, or zinc salts and a ferrocyanide) is now generally recognised. Since the method depends essentially on adsorption by the colloidal precipitate it would seem that the end-point might be sensitised still further by the use of a fluorescent substance. This occurred to the writer some two years ago, but the results with the fluorescent indicators then available were very little better than those obtained in ordinary daylight. Similar experiments by H. R. Fleck, R. F. G. Holness and A. M. Ward ("Analyst," 1935, *60*, 32) indicate the dependence of the end-point on the conditions of the experiment (*e.g.*, rate of addition of silver nitrate and the amount of indicator, etc.), and the work of E. Schneider ("Zeit. phys. Chem.," 1935, *28 B*, 311) gives one reason to believe that the halogen ion acts as a specific inhibitor of fluorescence. More recent experiments, notably with rhodamine-6G as indicator and with reactions in which halogen ions do not occur, have, however, given more encouraging results.

Another future development, on which work is proceeding, may be foreshadowed. Since colloidal substances flocculate within fairly narrow *p*H ranges (the iso-electric point) it should be possible to use a fluorescent adsorption indicator with such a colloid to indicate the end-point of an acid-alkali titration, the colloid being chosen such that the *p*H value of its iso-electric point is equal to that of the neutral point of the titration.

Sulphur Dioxide in Foodstuffs

The use af the term "indicator" in its widest sense enables us to include some rather interesting applications. As is to be expected most of these centre around the use of quinine, and in particular the fact that it fluoresces in the presence of sulphuric acid. It has been shown, for example (by J. Grant and J. H. W. Booth, "Analyst," 1932, *57*, 514; J. Grant and H. Procter-Smith, id., 1934, *59*, 749) that if a small quantity of a sulphite or sulphide is distilled in the presence of acid into hydrogen peroxide containing a little quinine, a fluorescence then appears owing to the formation of sulphuric acid and thence of quinine sulphate. The sensitiveness is 0.25 mg. of SO_2 or 0.1 mg. of sulphide-sulphur, and the method may be used for the detection of sulphur dioxide used as a preservative in foodstuffs.

The fluorescence of quinine sulphate also serves as a means of determining this alkaloid. The work of J. R. Nicholls ("Analyst," 1934, *59*, 277) and of E. Canals and P. Peyrot ("Comp. rend.," 1934, *198*, 746) and others, has shown that within limits the intensity of the fluorescence can be made proportional to the amount of quinine present, and the former has devised a "colorimetric" method of determination based on this principle. The writer has also shown ("Analyst," 1931, *56*, 653) that if quinine is dissolved in an excess of 0.01 *N* sulphuric acid the solution may be titrated with alkali, the neutralisation of the excess of acid being indicated by a change in the colour of the fluorescence. This enables the quinine to be determined.

The production or destruction of fluorescence as a result of chemical reaction, has enabled a number of sensitive qualitative micro-tests to be devised for various organic and inorganic compounds. The fluorescence of boric acid activated with fluorescein, the reaction of certain sugars with the resorcinols to form fluorescent reaction products, and the action of bromine in fluorescein may be mentioned as examples, but there are many others. The advantage of such methods is, of course, the increased sensitiveness obtainable owing to the small amount of substance required to produce a visible fluorescence. In conclusion it may be pointed out that fluorescent substances are frequently excellent "indicators" of the progress of physical phenomena such as penetration, and examples of this type of application are the use of rhodamine for studies of the rate of penetration of water through paper, etc. (Grant, "Trans. Soc. Chem. Ind.," 1934, *52*, 349 T; "Analyst," 1934, *59*, 749), and of mineral oils for investigating the structure of building materials.

Alcohol from Molasses

Burma Experiments

SUCCESSFUL experiments have been made in Burma in the production of alcohol from molasses, and this success has been achieved by the use of sulphuric acid and sulphate of ammonia, adding the former to the extent of 1 in 1,000 by volume and the latter to the extent of 1 in 1,000 by weight. The molasses is dissolved in a minimum of hot water and it has proved advisable to add the sulphuric acid to the hot solution. After standing overnight the solution is pumped into the vats containing the required quantity of cold water to dilute it to the correct concentration which is determined by its specific gravity. Sulphate of ammonia is added while pumping in the molasses and yeast is added immediately. It is important to keep the temperature as low as possible to prevent losses due to several causes, among which the chief seems to be the weakening of the yeast. In actual practice it has proved possible to obtain yields of more than 100 London proof gallons per ton of molasses on the large scale, using the methods described above. It may be noted than in India a yield of 80 gals. of London proof spirit is considered a good result as in many cases the yields may be only about 60 gal. of proof spirit per ton of molasses.

As the use of sulphuric acid is not without danger, it is hoped shortly to carry out similar tests on the large scale using sodium or ammonium fluorides instead of sulphuric acid. Preliminary tests have already been made, but the amounts of fluoride available in India have been too small to be effective. It is hoped that fluorides will be as effective as sulphuric acid, and, although the original cost of fluorides is fairly high, freight is relatively low and it may prove commercially advantageous to use fluorides instead of sulphuric acid.

Experiments were also made for the manufacture of starch from broken rice and sweet potato. In the case of rice, the starch was obtained by the usual process with 0.5 per cent. caustic soda and the gluten was precipitated from the alkaline liquid after contact for 56 hours with sulphuric acid. The purity of the starch was 96.46 per cent. and the sample was of very good quality. The gluten should be readily saleable as it contains over 40 per cent. protein. It is considered that starch manufacture from broken rice offers distinct possibilities. The preparation of good quality starch from sweet potatoes is not a simple operation in the laboratory if sedimentation only is relied upon. The potatoes are fibrous and grinding is difficult, and fine grinding to give high yields of starch results in much colloidal material being obtained and this is difficult to separate from the starch. Further attempts are being made by using alkaline sulphides.

Science and Industry

Annual Report of the Department of Scientific and Industrial Research

ACCORDING to the report of the Advisory Council of the Department of Scientific and Industrial Research for 1934-35 (H.M. Stationery Office, 3s. net), the council is by no means disappointed with the evidence which continues to reach them of a growing realisation of the importance of applying, at every stage of the process of industry, the help that science can afford. From research by itself it is, of course, admitted that practical benefits can seldom be expected; processes, however promising in the laboratory, need development and method in their application if they are to be useful under factory conditions.

The most encouraging development they have to report is in connection with the research association movement, to which they devoted the main part of their report two years ago. Last year they described the offer of increased financial support which the Government had decided to make if the industries represented by the associations were prepared to consolidate their position and prepare for the forward movement the times demanded. The results already achieved are undoubtedly a matter for satisfaction, and the advisory council looks forward confidently to increased effort by the industries concerned which will ensure a really vigorous and progressive development in the future. With one exception each of these associations now enjoys an income of at least £10,000, the minimum figure which, even in a small industry, can be accepted for the income of an association whose future can be considered assured.

Fuel Research

Under the Fuel Research Board the comprehensive study of the blending of coals to produce cokes satisfactory for industrial and domestic purposes has been continued in the chamber ovens. The effect of introducing steam into horizontal retorts during the last portion of the carbonising period has also been investigated. The introduction of steam is a common practice when carbonising coal in vertical retorts, and it has been tried in the past in horizontal retorts without success. The conditions for satisfactory operation were established in the horizontal retorts at the Fuel Research Station and the method developed has now been adopted by several of the larger gas companies in the country. These companies report that an additional 6 or 7 therms of gas per ton of coal have been obtained.

Plant for the hydrogenation-cracking of low-temperature tar and creosote, capable of treating from 200 to 400 gallons a day, has been brought into successful operation. The tar is heated to about 480° C. in the presence of hydrogen and at a pressure of 200 atmospheres, and then passed into a vessel containing the catalyst (molybdenum sulphide). With suitable tar about one-half is converted into motor spirit by one passage through the catalyst. The motor spirit is separated by distillation and the residue, mixed with fresh tar, is recirculated through the converter. In the final result the volume of motor spirit produced is equal to that of the original tar treated. It has been found that tar obtained by carbonising coal up to temperatures of about 700° C. is suitable raw material for a one-stage process, and this has also been found to apply to fractions of high-temperature tar distilling below 360° C. If hydrogenation of the whole of such tars is required, a two-stage process will be necessary.

Progress has also been made in determining the conditions underlying the formation of stable suspensions of pulverised coal in oil. Such suspensions may be substituted for fuel oil for certain purposes and while possessing many of the advantages of fuel oil, offer a means of using substantial proportions of coal.

Investigations concerning meat have been an outstanding features of the activities of the Food Investigation Board. Work has been continued on the effect of the pH of the aqueous medium in contact with fat on its rate of oxidation, and on the pro- and anti-oxidant properties of different substances dissolved in the aqueous phase. In connection with the possibilities of reducing microbial growth on meat by the introduction of traces of ozone into the store, experiments are being carried out on the rate of oxidation of various fats exposed to definite concentrations of the gas. Low concentrations of ozone, *e.g.*, five parts per million for five hours a day, greatly accelerate the oxidation of films of pure fat (lard, beef-fat and egg-oil) at 0° C.

Work is also in progress on the structure of the white, yolk and membranes of the hen's egg, and also on the identity of the proteins in these systems. The changes that take place during the storage of eggs have been further investigated, and in particular the many aspects of gas-storage have been more clearly defined.

Determination of Fat in Meat

To determine the amount of fat in meat, it has hitherto been necessary to carry out chemical analyses which were laborious and involved destruction of material. In collaboration with the British Food Manufacturers' Research Association, a method of measuring the electrical resistance has been devised that can be carried out rapidly, and that gives an approximate value for the fat without affecting the meat. By this method it is possible to measure the thickness of layers of fatty and muscular tissues in pork, bacon and hams, to a millimetre, and it can therefore be used for grading carcasses intact by measuring the thickness of the back fat.

The study of the refrigeration of the herring is being continued at the Torry Research Station. Winter herrings of low fat-content were brine-frozen, glazed and stored at 28° C., and after six months' storage had a low peroxide content and no rancidity was detectable on tasting them; on the other hand, similar herrings, similarly treated except that the temperature of storage was —20° C., had a higher peroxide content and a trace of rancidity on tasting. The work is now proceeding with batches of summer fish of high fat-content, and also with slightly less rich autumn fish.

The study of the metabolism of carbohydrate in the potato has revealed a well-marked effect of temperature on the relative proportions of sucrose and the hexose sugars, glucose and fructose. At low temperatures sucrose increases relative to the hexose; the reverse change occurs on removal to higher temperatures. In another direction the use of paper wraps treated with a solution of iodine in potassium iodide has been studied, as such wraps are found to retard appreciably the onset of rotting in certain fruits.

The Use of Aluminium Vessels

In canning practice recent tests show that aluminium cans are unsuitable for fruits. Investigations have also been carried out on the general behaviour of aluminium towards organic acids and their salts, and interesting results connected with the breakdown and repair of protective films at the surface of the metal have been obtained. There seems no doubt that the tendency for aluminium to form complex ions with hydroxy-organic acids is responsible for much of the corrosion which it undergoes under certain conditions. Tests with tin sheet containing small quantities of antimony and bismuth showed that both these metals inhibited attack by dilute solutions of citric acid. Bismuth was the more effective in this respect, 0.1 to 0.4 per cent. causing a reduction of 20 per cent. in the rate of corrosion.

At the Building Research Station a co-operative research is being carried out in conjunction with the Natural Asphalte Mine-Owners' and Manufacturers' Council on asphalt mastic

roofing materials. The work in hand comprises a study of the physical characteristics and weathering properties of several types of mastic under natural conditions of exposure and in accelerated laboratory tests, and an investigation of the temperature attained in an experimental asphalt roof. The work on the constitution of cement has now reached a stage where the knowledge gained can be applied in detail to specific problems of manufacture.

A study of the effect of various insecticides on glues used in the manufacture of plywood has been begun, and tests have been undertaken to obtain information on the subject; the results will be of value to the plywood industry. Experiments to determine the relative efficacies of various chemicals used in dip treatments for the prevention of stain in timber caused by fungi have also been in progress during the year. These are of considerable economic importance, as the annual loss to timber merchants through the action of stain-producing fungi is appreciable.

Metallurgical Research

An investigation on the development of magnesium alloys of good mechanical properties is receiving prior attention under the Metallurgy Research Board. The programme also includes some constitutional work on magnesium-rich alloys containing cadmium and zinc, and work on the heat treatment and mechanical properties of certain ternary and complex alloys. Certain magnesium alloys containing cadmium and zinc have now been successfully rolled from extruded material, which was found to respond to rolling treatment much more readily than cast material of similar composition. By suitable mechanical working and heat treatment an alloy containing 8 per cent. cadmium and 8 per cent. aluminium (density 1.92) obtained mechanical properties approaching those of duralumin (density 2.8).

The experimental difficulties involved in the determination of the solubility of gas in liquid aluminium have now been surmounted and measurements have indicated that the solubility is very low; this work links up closely with the study of the nature of oxide films and their permeability to gases. The investigation on the influence of silicon on the mechanical properties of aluminium casting alloys has been completed so far as one range of alloys is concerned, and it is not proposed to continue the work unless further information is desired by the industry.

The investigations into the part played by dissolved gases during the solidification of steel have been further continued. The difficulty experienced in determining the solubility of gas in molten iron, on account of the gas permeability of the refractories at high temperatures, has been overcome by the construction of a molybdenum or tungsten-wound furnace which is totally immersed in water during the experiments. Satisfactory results have now been obtained for the solubility of hydrogen in pure iron, but the furnace design is being modified to secure still greater accuracy of results.

Water Pollution

Further experiments in the laboratories of the Rothamsted Experimental Station and of the Birmingham, Tame and Rea District Drainage Board have indicated the conditions necessary for the satisfactory purification of effluents from dairies and milk products factories by the process of biological oxidation in percolating filters and by the activated sludge process. For the purpose of testing these processes on a large scale under commercial conditions two experimental plants have been erected at Ellesmere, Shropshire, where facilities for the work have been provided by United Dairies, Ltd. The investigation is now being carried out in co-operation with the milk industry, through the Milk Marketing Board, who have agreed to contribute in the first instance £3,000 a year for two years towards the cost.

At the Chemical Research Laboratory experiments have been carried out with a mixture of carbon monoxide and hydrogen in apparatus designed to work at pressures up to 3,000 atmospheres and temperatures up to 250° C. In presence of a copper chromite catalyst at 220° to 250° C., methanol was the only product obtained under a pressure of 2,500 atmospheres. Investigations of the production of aliphatic acids from carbon monoxide and alcohols have been extended from methanol to ethyl and higher alcohols. The formation of propionic acid from ethanol in presence of a phosphoric acid-copper phosphate catalyst is favoured by increased temperature over the range 260-380° C. Unfortunately, however, increased temperature favours to a still greater extent the formation of olefinic oils. With propyl and butyl alcohols reactions occur readily with carbon monoxide under 200 atmospheres pressure in the presence of the above-mentioned catalyst at 200° to 210° C., accompanied by only a small production of olefinic hydrocarbons.

An investigation into the causes of corrosion of tar stills carried out for the Association of Tar Distillers shows that the resinoid constituents of tar are the most active agents in promoting corrosion at high temperatures. The activity of these resinoids decreases as the temperature of carbonisation of the coal rises. Ammonium chloride in entrained aqueous liquors also contributes to the corrosive properties of tars.

Numerous samples of coal ash have now been examined for the presence of germanium and large-scale extractions have been carried out on the more promising samples. In addition, a study has been made of certain flue dusts for the presence of gallium with, in many instances, promising results. Some work has also been done on the chemistry of rhenium. Interesting results have been obtained by a study of ruthenium, a rare element of the platinum group. The constitution of "ruthenium red" has now been shown to be $[RuOH.H_2O.4NH_3]Cl_2$, thus bringing this inorganic colouring matter into line with modern views of co-ordination compounds.

Industrial Respirators

Laboratory work on the detection in the atmosphere of small quantities of toxic gases commonly occurring in industrial processes is almost complete. Methods have been developed for the detection and estimation of hydrogen sulphide, arsine, organic halogen compounds, carbon monoxide, sulphur dioxide, nitrous fumes, aniline vapour, hydrogen cyanide, chlorine, carbon disulphide vapour, and benzene vapour, and are now being examined for their suitability for use under industrial conditions. Work has been begun with the object of standardising performance tests for respirators for use in industry as a protection against such gases. In the work on the detection of toxic gases and on the testing of respirators for protection against such gases the Department has the financial and technical co-operation of the Association of British Chemical Manufacturers.

Lead Arsenate in Brazil

BETWEEN 3,000 and 4,000 metric tons of lead arsenate will be required effectively to control insect pests which infest a great part of the 3,000,000 acres of land in the State of Sao Paulo employed for the 1936 cotton crop. This insecticide is considered most effective in combating the "Curuquere" (*Alabama argillacea*-Hubner), the most destructive of all cotton insect pests found in the State, and its use has been greatly stimulated by an energetic and well-directed educational campaign conducted by the State Ministry of Agriculture. Literature issued by the Biological Laboratory of this Ministry recommends the use of lead arsenate in a solution consisting of from 350 to 500 grams to 100 litres of water. This is applied to the leaves of the cotton plant by means of a sprayer. It was estimated that between 75 and 80 per cent. of the lead arsenate which will be consumed in the State of Sao Paulo during the current crop season would be imported from Germany and Japan, while the rest would be supplied largely through local production. Only recently, the firm of Cocito and Irmao, of Sao Paulo, completed an installation of equipment capable of producing two tons of lead arsenate daily.

Hydrogen Production by the Badische Process—X.

Economics of the Process

In continuation of notes on the Economics of the Synthetic Manufacture of Ammonia, published in "The Chemical Age," October 5 to November 16 inclusive, the present series deal particularly with the design of the plant for the production of hydrogen by the Badische Process.

THE bulk of the ammonia should be removed and a scrubber, with sulphuric acid in a similar scrubber, would suffice. The quantity of sulphuric acid required would be

$$\frac{395 \times 98}{385 \times 2} = 50 \text{ lb. per minute.}$$

$$= 100 \text{ lb. } 50\% \text{ acid sp. gr. } 1.4$$

$$\frac{10}{1.4} = 7.14 \text{ gallons per minute.}$$

The heat evolved would be

$$\frac{395}{385} = \frac{17}{34} \times 45{,}600 = 23{,}400 \text{ C.H.U. per minute.}$$

So that the scrubber would have to be cooled by about

$$\frac{23{,}400}{10^{\circ} \times 10} = 234 \text{ gallons per minute of water.}$$

The volume of liquid passing through the scrubber would be small, but, as arranged, a fairly strong ammonium sulphate solution would pass out at the bottom and this internal cooling would be necessary to prevent the separation of solid ammonium sulphate. Lead coils would probably be suitable for effecting the required cooling. The scrubber would be constructed of lead in this case.

The gas would next pass through the lime boxes, only about 12 being required to remove the final traces of CO_2 (as before described).

Gasholder

From here the gas would go direct to the gasholders for one hour's supply = 500,000 cu. ft., the necessary pure nitrogen being added before entry to the gasholder to make the composition exactly correct, the composition of the final gas being

H_2	9,648,650		75%
N_2	3,216,300		25%
+ A	21,500		0.6%
	12,886,450		

The quantity of hydrogen budgetted for in the foregoing discussion is about 13 per cent. in excess of the required amount; this allows a sufficient margin for possible leakage at the compressors, scrubbers, etc. (The quantity of methane has been neglected throughout: it is likely to fluctuate according to the quality of the coke and the temperature of the W.G. generators; the effect of the small percentage will not materially effect these computations.)

The final gas should contain no CO, if the fractional combustion is effective, and the nickel catalyst for the conversion of traces of CO and CH_4 which was necessary for the Lane plant could be excluded. Results make it probable that complete removal could be attained if the temperature is controlled throughout the fractional combustion catalysis. If it is necessary to provide a nickel treatment the plant required would be the same as for the Lane gas purification; but it would be necessary to provide the heat by preheaters, as in the above design no spare heat is available. It is probable two nickel catalyst tubes in the high pressure system before entry of the gas to the Haber bomb would be sufficient security against traces of CO and would be the simplest installation.

Summary: Removal of Carbon Dioxide and Sulphur.

Ten converters with special interchangers, designed to give temperature control.

The converter can be made autothermic.

Nitrogen suggested as a diluent, to economise steam.

One preheater required for each group of five converters for starting up.

One scrubber for each group of five converters.

Lime box plant would be large, requiring 70 tons of lime per day and 24 (45 ft. × 40 ft.) boxes. One quarter of the plant would only be necessary if preliminary scrubbing with ammonia (requiring a maximum of about 13 per cent. of the total ammonia produced) was carried out and ammonium sulphate produced.

The gas, mixed with steam and nitrogen, is boosted through the interchanger and converters, mixed with heated air in the lower portion of the converter, back through the interchangers, through the water, scrubbers, through ammonia and sulphuric acid scrubbers and thence to lime boxes and gasholder.

Quantity of steam 234 tons per day.

Quantity of air 1,322 cu. ft. per minute.

Investigation, etc.

Surface velocity relation for catalyst for different steam ratios, nitrogen ratios, air ratios, etc. (no CO_2 present).

Whether CO can be completely removed from gas containing only 1 per cent. of CO, but 30 per cent. CO_2; also whether, when no CO_2 present, it can be completely removed in presence of N_2.

Depth of catalyst for different conversion (percentages) at velocity 18 ft. per second.

Life at catalyst.

Results with different catalyst support.

Complete design of interchangers and converters.

Loss of heat and pressure in different portions of plant.

Catalyst Manufacture

A plant will be required for the preparation of catalyst. From the experiments which have been carried out, the Fe-Cr-Ce catalyst appears to possess a long life, provided in the water gas catalysis there are no tarry or unsaturated compounds present in the gas, and in the fractional combustion provided there are no sulphur compounds which sulphate the catalyst and render it inactive. Experiments will be made on the life of the catalyst; supposing it lasts one fortnight, the following would provide the data for requirement of catalyst.

Number of cubic feet of catalyst ($\frac{5}{8}$ inch) required.

Total space (fractional combustion)	800 cu. ft.
,, ,, (water gas catalysis)	857 cu. ft.
	1,657 cu. ft.

or 165 × 0.715 = 1,185 cu. ft. of actual catalyst.

Let density be about 3, then

$$\frac{1{,}185 \times 62.5}{3 \times 2{,}240} = 11 \text{ tons are required.}$$

The *catalyst is prepared* from 100 parts iron, 11 parts ammonium bichromate, and 2 parts cerium nitrate.

100 parts iron give

$$\frac{160 \times 100}{112} = 143 \text{ parts of } Fe_2O_3 = 95.0\% \ Fe_2O_3$$

11 parts ammonium bichromate

$$\frac{152 \times 11}{252} = 6.6 \text{ parts of } Cr_2O_3 = 4.5\% \ Cr_2O_3$$

2 parts cerium nitrate (@ 60 per cent. Ce)

= about 0.75 parts of $Ce\ O_2$ = 0.5% CeO_2

To prepare about 11 tons of catalyst would require about :

Iron	8 tons.
Ammonium bichromate	1 ton.
Cerium nitrate	1 C.W.T.
Nitrate acid	60 tons.

$$= \frac{60 \times 2{,}240}{13.2} = \text{(about) } 10{,}000 \text{ gallons.}$$

If the work is spread over 14 days, 4.3 tons of nitric acid (50 per cent.) would have to be evaporated per day, requiring about *three* (5 *ft.* × 2 *ft.*) *pans* and a battery of *six absorption towers* (at 120 cu. ft. per 1 lb. of NO_2 per minute).

When once made the spent catalyst could be re-dissolved in nitric acid and re-evaporated, so that the actual expense of catalyst manufacture should not be great. The solution should be made in a separate deeper Narki vessel, which can be warmed and it should then be run into the shallower pans for evaporation.

The catalyst, when pasty, should be broken up into 1 inch lumps and ignited strongly in a separate vessel. The catalyst is then graded to about ⅛ inch size. It is a yellow-red mass, rather friable.

Experiments will be made with various supports (such as diatomite), soaked in a similar catalyst with a view to the saving of catalyst and a greater yield per unit of surface. Until these experiments are complete it is not worth going into greater detail over this portion of the plant. It is already known that activated spathic ore is suitable for the water gas catalyst, so that there is every chance of success in this direction. Up to the present the same catalyst has been used for both conversions (water gas and fractional combustion), but it may well be that a catalyst suitable for one would be unsuitable for the other; for instance, spathic ore is not satisfactory for the fractional combustion.

Economics of the Process

Referring to the data already recorded the following quantities of materials, etc., are required for the plant per day :—

Steam (700) 934 tons.
= coal @ 7 lb. steam = 1 lb. coal 134 tons.

Coke 214 tons.

Power : For compression 2,790 h.p.
Recovered 1,800 990)
For pumping 1,540 1,450 h.p. = 25,900
Recovered 1,080 460) K.W.H. (energy).

Lime : If ammonia used, 17.5 tons.
If ammonia not used, 10 tons.

Coke for preheaters—only occasional.

Ammonia (100 per cent.) 15.5 tons.

Sulphuric acid (50 per cent.) 94 tons (providing ammonium sulphate 62 tons).

Air (apart from water gas plant) 1,906,750 cu. ft. per 24 hours.

Water (crude) :

Scrubbing catalysed water gas	114,000 gal. per hr.	2,740,000.
,, purified ,, ,,	43,700 gal. per hr.	
For cooling scrubbers (NH_3)	20,000 gal. per hr.	
	65,700	1,820,000.
	gal. per day	4,560,000.

Water (pure) : Pressure scrubbing, 4,500 gal. per min., circulated therefore make up 100,000 gal. per day.

Boiler water (evapd.) (exclusive of power)	224,000 gal. per day.
Cooling water $\frac{2{,}790 \times 24 \times 1{,}900}{20 \times 10}$	637,000 gal. per day.
	961,000 gal. per day.

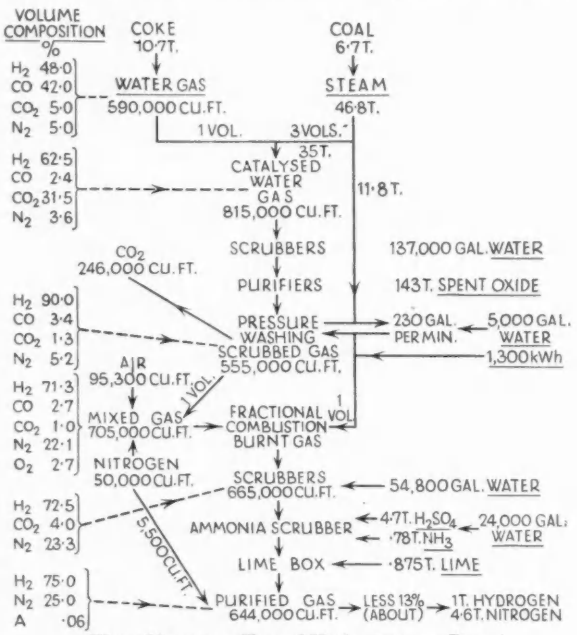
Power : For boosting @ 45 million cu. ft. against 2 lb. pressure, 300 h.p.

Oxide : For purifiers, quantity of spent oxide 2.86 tons per day (this fresh oxide is more than paid for by the spent oxide).

Catalyst—(say) 1 ton per day (undetermined).

In the latter case the catalyst is recoverable and so the expense is only the cost of evaporation with nitric acid and the initial cost of the materials.

A flow sheet showing the quantities of materials (and volumes of gases at 20° C. and normal pressure) on a basis



Flow Sheet per Ton of Hydrogen per Day.

of production of 1 ton = 430,000 cu. ft. of hydrogen per 14 hours is given above.

Choice of Scheme of Manufacture

The choice of the scheme of manufacture which has been described depends on decision as to the following points : (1) By what means the CO_2 is removed. (2) By what means the CO is removed. (3) Whether, if water scrubbing is used to remove CO_2, this is done before or after the removal of CO. (4) Whether nitrogen should be made separately in a liquefaction plant or along with the water gas. (5) Whether the process is as economical as the steam iron process.

(1) *Removal of* CO_2.

The following methods have been investigated :—

(a) Pressure water washing.	Satisfactory, but requires much mechanical plant.
(b) Potash scrubbing.	Cumbersome scrubbing and boiling plant, forty-eight 25-ft. scrubbers, 10 boilers or 40 denitration towers.
(c) Ammonia scrubbing.	Requires too much ammonia to be useful for removal of *whole* CO_2.
(d) Pressure washing with acetone.	Requires much solvent, but smaller plant than (1) and less power.
(e) Diffusion.	Too slow.
(f) Removal by lime.	Requires too much lime.

In the first case (a) the cost may be roughly estimated as follows :—

Power : 25,900 K.W.H. @ 0.25d. = 6,475d. for 8,540,000 cu. ft. Therefore, for 1,000 cu. ft.	0.76d.
Water @ 1d. per 1,000 gal. Therefore, 100,000 gal. for 8,540,000 cu. ft. Therefore, for 1,000 cu. ft.	0.01d.
Labour (say) 18 men at 10s. per shift of 8 hours	0.25d.
Maintenance (say)	0.5d.
Total (without interest on capital, etc.)	1.52d.

In the second case (b): *Fuel* for heating (CO_2 absorption) (say) 2.0d.; *labour* (about) 0.2d.; *maintenance* (about) 0.3d.; equals a total of 2.5d.

The interest on capital at 10 per cent. (say) on £250,000 in the first case may be taken as 2d. The difference in the total cost is not likely to be very different, but the water washing has on the whole more in its favour.

(2) *Removal of CO.*

There is the choice of the following methods:—

(a) *Scrubbing with NaOH* at 50-100 atm. and 150-250° C.	Troublesome and requires mechanical plant; also expensive, unless market found for formate (5,000 tons); does not remove all CO.
(b)* *Scrubbing with cuprous salts,* at 10-20° C. and 100 atm.	Requires mechanical plant.
(c) *Methanation with nickel catalyst* at 300° C.	Too much CH_4 produced if all CO removed thus.
(d)† *Fractional combustion* at 250° C.	Satisfactory low pressure plant gives CO_2 which has to be removed subsequently.
(e)† *Combination of water gas* catalysis and fractional combustion or methanation.	Not autothermic and whole gas has to be heated up to 500° C., therefore expensive.

[* On the basis of notes on CO absorption in CuCl for phosgene manufacture, the quantity of CuCl solution required to absorb 300,000 cu. ft. of CO per day would be 5,700 gal. per hour, or 68,000 lb. to be heated through 30° per hour which requires of fuel 3 cwt. = 3s. or per 1,000 cu. ft. of hydrogen $\frac{24 \times 36d.}{8,540}$ = 0.1d., and of fuel about 0.25d., so that the cost, excluding the cost of compression, would be very low by this method. On the other hand, the pressure cannot be let down after the removal, and the gas would have to go *direct* to the Haber plant, otherwise the cost of compression would be excessive.]

[† As worked out, the process is autothermic; there is only 1 volume of steam to add or equivalent to about 8.7 lb. of coal per 1,000 cu. ft. of hydrogen, *i.e.,* about 0.94d. The maintenance, catalyst, etc., is not likely to be so great a cost, as similar costs in the running of the copper plant, and so there is little or no doubt as to the best method.]

The remaining three points affecting the economy of the water gas process (namely (3) the position of the CO_2 scrubbing plant (4) the manufacture of nitrogen and (5) the comparative cost of catalytic and steam iron processes) will be dealt with next week.

Continuous Drying Plant

Four Characteristic Designs

A CONTINUOUS dryer of the travelling band type dryer is shown in Fig. 1. This type of dryer is used largely for low temperature drying and for materials in a granular form.

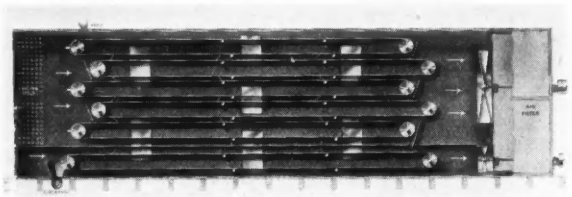


Fig. 1.

After drying the product is cooled before being discharged from the dryer. Such dryers tend to speed up production and reduce labour and handling costs.

Fig. 2 shows a simple conveyor type dryer used for small productions and for drying materials of a granular or fine

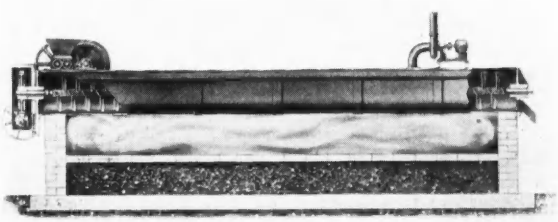


Fig. 2.

sandy nature. Such dryers can be arranged for heating by coal, coke, gas, oil, steam, hot water, etc.

For materials to be handled in large quantities, which do not cake or stick, rotary tube dryers generally find a wide application, as such dryers are very economical in labour and fuel costs. Such a dryer is shown in Fig. 3. This dryer is of the direct heated type, and fuel consumption per ton of dried product is less than the indirect heated type of rotary

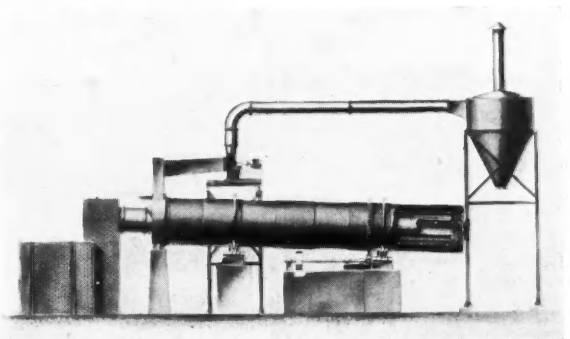


Fig. 3.

dryer. Whether a direct or indirect heated dryer is used depends entirely upon the nature of product being dried.

Fig. 4 shows a batch calcining furnace of the rotary type. Such furnaces are used for the production of barium sulphide, sodium sulphite, etc. For certain manufacturing operations

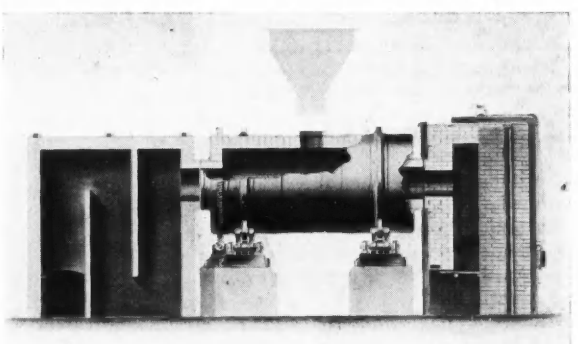


Fig. 4.

the batch calcining furnaces are more convenient than the continuous tube kilns and furnaces.

The accompanying photographs are reproduced by courtesy of L. A. Mitchell, Ltd.

Company Registrations at Somerset House

Nearly 500 New Chemical Undertakings in 1935

THE annual statistical report on company registrations at Somerset House in 1935, compiled by Jordan and Sons, Ltd., company registration agents, shows that notwithstanding the financial anxieties experienced during the year the total number of new companies incorporated was 13,103, against 12,475 in 1934—an increase of 628. Of these, 12,673 were private companies, showing an increase of 644 over the figures for 1934. There was a slight decrease in the number of public companies (430 compared with 446) and it is pointed out that this decrease may be more apparent than real as there is a growing tendency to register companies as private and convert them into public companies shortly afterwards. The figures relating to nominal capital follow the same trend, showing in the case of private companies an increase and in that of public companies a decrease. The decrease exceeds the increase and consequently the aggregate nominal capital of companies registered during the year is down by £6,906,296.

During the year 14 companies were registered with original share capital of £1,000,000 and upwards, including C. I. M. Holdings, Ltd., £1,333,333 (in the oil group), and Aspro, Ltd., £1,000,000 (in the chemical group). Other big capitals included British Cellophane, Ltd. (£900,000), and Phosferine (Ashton and Parsons), Ltd. (£500,000). The gross nominal capital of companies registered during the year would be greater if the list included companies registered with small capitals which subsequently registered large increases of capital, of which two noteworthy examples were Macleans, Ltd. (original capital of £100 increased to £1,500,000), and Ruberoid Co., Ltd. (original capital £100 increased to £600,000). Amongst the most important companies registered during the year were Glaxo Laboratories, Ltd., with a capital of £400,000.

The following items are extracted from the statistics:

Classes	Public Companies.		Private Companies.		Totals.	
	Number Registered*	Capital	Number Registered	Capital	Number Registered	Capital
		£		£		£
Cement, &c. ..	18	1,943,900	185	2,230,900	203	4,174,800
Chemicals ..	9	1,161,050	489	2,361,761	498	3,522,811
Engineers ..	23	3,309,450	705	3,301,474	728	6,610,924
Food	20	1,650,850	976	6,556,488	996	8,207,338
Glass and Pottery	2	100,100	70	313,025	72	413,125
Leather	—	—	77	250,910	77	250,910
Metals	2	465,000	97	747,600	99	1,212,600
Miscellaneous ..	36	770,200	323	957,637	359	1,727,837
Oil	2	1,633,333	54	447,608	56	2,080,941
Rubber	4	1,100,000	37	270,500	41	1,370,500
Others	114	12,033,783	2,943	17,124,878	3,057	29,158,661
Totals (for year 1935)	430*	54,870,733	12,673	81,763,377	13,103	136,634,110
Corresponding figures, 1934 ..	446	69,761,622	12,029	73,778,784	12,475	143,540,406
1933	330	39,857,295	11,054	54,688,261	11,384	94,545,556
1932	255	17,858,458	9,949	52,346,038	10,204	70,204,496

*In this Column are included 103 "Companies Limited by Guarantee" and "Associations Not for Profit" without Share Capital, such Companies being technically Public however small the Membership may be.

A New Range of Dyestuffs for Acetate Silk

Solubility and Accurate Control

A DEVELOPMENT of the first importance to the future of the artificial (acetate) silk industry lies in the news that Imperial Chemical Industries, Ltd., have produced an entirely new range of dyestuffs which will be known as the Solacet colours. It is claimed that these new colours are the first dyestuffs to satisfy perfectly the requirements of acetate silk. Ever since the introduction, immediately after the war, of artificial silk made from cellulose acetate, British dyestuffs chemists have led the attack on the problem of finding satisfactory dyestuffs for the direct dyeing of the new yarn.

Since it was the pioneer work of the British Dyestuffs Corporation (now the I.C.I. Dyestuffs Group) that made possible the great development of the world rayon industry, it is fitting that they should now set the crown on their labours by the perfection of Solacet colours.

The Solacet colours are ideal in that they have a direct affinity for cellulose acetate and their application can be more accurately controlled than has ever before been possible. They are soluble in water and possess the valuable advantage of enabling the silk to be treated similarly to cotton dyed with direct cotton colours. The dyeing can be controlled by temperature or additions of common salt to the bath—a point that will be appreciated by all concerned with the questions of penetration and exhaustion of the dyestuffs used on cellulose acetate fabrics.

The introduction of cellulose acetate silk was an event of extraordinary commercial significance, but it was immediately realised that in the difficulty of dyeing lay a big obstacle to progress. There were no really efficient dyestuffs available for the direct dyeing of the product, and the feverish efforts made to find methods of applying existing dyestuffs were likewise without really satisfactory results. In the very early days the British Dyestuffs Corporation, Ltd., were called in by the manufacturers and set a large body of research chemists to work on two lines—the discovery of new dyestuffs and the application of existing dyestuffs. The first result came in 1922 from the first line of research and was welcomed eagerly, even though the necessity of using a diazotisation and development method made the new dyestuffs none too easy to apply. They were the Ionamines. and even to-day Ionamine A is widely used for the production of black shades.

The next step was to eliminate the diazotisation process and this the British Dyestuffs Corporation achieved in 1924-25 when they introduced the Duranol colours. These not only had the advantage of being applicable by a one-bath process but provided the dyer with a range of hues hitherto unavailable and of excellent all-round fastness properties. Hard upon them followed the Dispersol dyestuffs. Both types possessed a direct affinity for cellulose acetate; both were insoluble in water and owed their dyeing properties to the presence of special chemical groupings; both were applied by simple immersion of the acetate silk in a suspension of the dyestuff in water.

These products undoubtedly played an extremely important part in the development of the use of acetate silks made from cellulose acetate, but they were little more than a temporary substitute for the perfect dyestuff. This it was now definitely realised would not be one relying on its dispersion for successful application but one which was water soluble and capable of being used direct by a one-bath process. Of such a character are the Solacet colours. the first of which will be marketed shortly under the names of Solacet Fast Scarlet BS and Solacet Fast Crimson BS.

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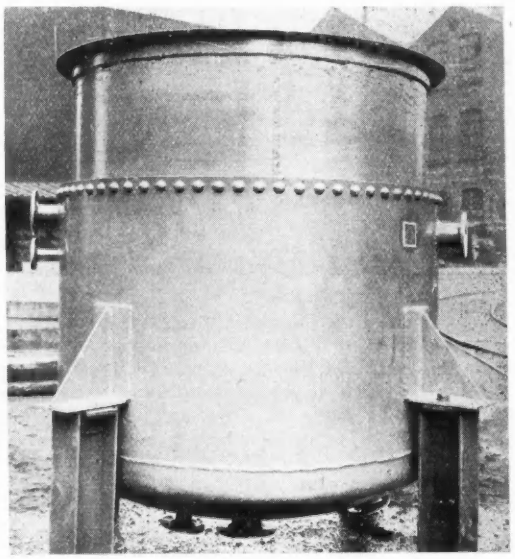

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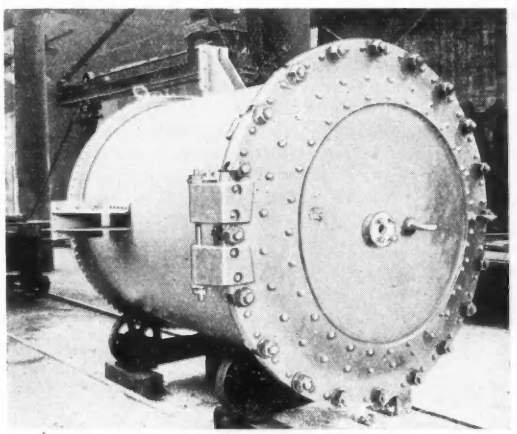

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Australian and American Cottons

A Comparison of Dyeing Properties

A COMPARISON of the dyeing properties of Australian grown cotton and native American cotton was made in a paper which Mr. H. A. Thomas, Ph.D., B.Sc., A.I.C., read at a meeting of the Manchester Section of the Society of Dyers and Colourists on January 17.

In the course of technical service given by the Dyestuffs Group of Imperial Chemical Industries, Ltd., said Mr. Thomas, an interesting problem was encountered in connection with the dyeing properties of Australian grown cotton. A request was made by the Australian branch to investigate the difference in depth of shade produced with equal percentages of dyes on Australian and American cotton. It was alleged that in order to obtain a depth of shade on Australian cotton equal to that of American cotton dyed under the same conditions, 30 per cent. to 40 per cent. more dyestuff was required. Since manufacturers in Australia were compelled to employ not less than a fixed proportion of Australian grown cotton with the imported American variety in their fabric, dyeing difficulties with regard to levelness of shade had been experienced. It was considered, also, that it was impossible to produce a full bloomy black with sulphur or direct colours, however high the percentage of dyestuff employed.

Comprehensive Investigation

A comprehensive investigation was, therefore, undertaken with samples of raw Australian grown cotton (Queensland crop), and also a sample of " Durango " cotton obtained from the Crown Agents for Queensland. The dyeing and general properties of these exotic Australian varieties were compared with those of samples of indigenous American cotton.

The two varieties of cotton were dyed in separate baths under comparative conditions with the following representative dyes. These dyes were selected in pairs, one in each pair possessing good and the other comparatively poor penetrating properties. The following percentages were employed of the good penetrating colours: 2 per cent. Chlorazol Fast Red KS; 1 per cent. Chlorazol Blue GS; 1.2 per cent. Chlorazol Fast Orange GS. The percentages of the dyestuffs with poor penetrating qualities were as follows: 2 per cent. Chlorazol Rose BS; 1.3 per cent. Chlorazol Sky Blue FFS; 3 per cent. Chlorazol Fast Orange DS. With all the dyes employed it was found that the American cotton was dyed to a stronger shade than the Australian. The average difference, as judged by eye, was about 30 per cent. of the total weight of colours present.

Microscopical Examination

A general microscopical examination, conducted by the Physical Chemistry Research Section of I.C.I. Dyestuffs Group, disclosed that the fibres of the Australian cotton were flatter and more ribbon-like than the fibres of the American variety. Small lustrous patches picked from the bulk samples of both cottons were also examined. The fibres from the patches in the Australian cottons were markedly flatter and more ribbon-like than those previously examined from the normal bulk, and contained also a greater proportion of neps, whereas the lustrous patches in the American cotton were not very different from the remainder. Preliminary examination of samples of both varieties of cotton, dyed with direct cotton colours, showed that the differences in dyeing strength were not due to aggregation of dyestuff into particles on the surface of either cotton.

Work was directed to the use of caustic soda as a swelling agent. Since the differences in dyeing strengths obtained with direct colours on both varieties of cotton appeared to be almost entirely due to differences in wall thickness of the fibres, direct colours alone were employed in preliminary experiments designed to determine the most suitable concentration of caustic soda to employ in the swelling treatment. A series of experiments were conducted employing caustic soda of the following strengths: 55° Tw., 40-44° Tw., 26-28° Tw., 22-24° Tw., 15-17° Tw., 11-12° Tw. The two varieties of cotton were immersed for ½ hour at room temperature, and were finally rinsed in running water until the wash liquor no longer showed an alkaline reaction to litmus. The most uniform swelling results were achieved by employing three parts per thousand of Perminal MERC in the alkaline liquor.

In the final result it was shown that there were two important differences between the raw American and the raw Australian cotton employed in the investigation. The majority of Australian cotton fibres, while being approximately the same width (maximum diameter), were thinner (minimum diameter) than the American cotton fibres and were consequently more ribbon-like, the walls being thinner. The raw Australian cotton contained a larger quantity of pectic or lignocellulosic derivatives possessing a higher affinity for basic dyes, but a lower affinity for sulphur, vat and azoic dyes than that of cellulose.

Effect of Compensating Treatment

Microscopic examination showed that the effect of the compensating treatment used was to swell both fibres until they approached the circular cross-section characteristic of mercerised cotton and acquired approximately equal diameters. It was found that equal weights of the two varieties of cotton were still equal in weight after the swelling treatment. The swelling process was accompanied by a corresponding shrinkage in length of the fibre, and, since two fibres had been swollen to equal cross-section without change in relative density, they must present equal surface areas. The treatment, therefore, eliminated the physical causes of the uneven dyeing.

Owing to the greater wall thickness of the American fibre it was possible to swell American cotton by a more drastic treatment with stronger caustic soda solution to a greater extent than the Australian cotton, *i.e.*, if both varieties of cotton were completely mercerised then the physical inequalities were again apparent, and the differences in dyeing strength reappear. Using a 10.5 per cent. aqueous solution of caustic soda the Australian fibres were more completely mercerised than the American cotton fibres. If complete mercerisation was achieved by employing stronger caustic soda solution, then the majority of the American cotton fibres swelled to a greater area of cross-section than the majority of the Australian cotton fibres. If caustic soda solution weaker than 10.5 per cent. were employed a satisfactory compensating effect was not produced, probably because the alkali was not strong enough to mercerise the Australian cotton fibres sufficiently. Dyeing results had shown that foreign matter removable by hypochlorite was more readily extracted from the swollen fibre than from the untreated fibre.

A PRINTING ink that can be bleached easily preparatory to converting old newspapers into paper has been invented by a German professor. The pigment of this vanishing ink is manganese peroxide and the bleaching agent sulphur dioxide. Two domestic papers were printed with the ink for some time as an experiment, and the old copies could be bleached easily. However, in order to be of value to the paper industry such methods must be adopted universally, otherwise the work of sorting out the bleachable papers from among the tons of old newspapers received in the paper mill is costly enough to offset any advantages.

Chemical Trade Conditions in Canada

Increased Imports from the United Kingdom

ACCORDING to a report by Mr. F. W. Field, senior British trade commissioner in Canada and Newfoundland, on "Economic Conditions in Canada, 1934-1935," issued by the Department of Overseas Trade (H.M. Stationery Office, 4s. net), the Canadian chemical industry is expanding rapidly and there is comparatively little import trade in chemicals of such kinds as are made in Canada. Canadian Industries, Ltd., which is associated with Imperial Chemical Industries, Ltd., is, of course, one of the principal manufacturing undertakings.

The Dominion Bureau of Statistics has furnished information with regard to the principal Canadan domestic exports during the past year. An increase in exports in 1934 over similar exports in 1932, amounting to $159,078,000 or 32.2 per cent. occurred in each of the nine main groups, the figures for chemical and allied products being as follows:

	(*Thousands of Dollars.*) 1932.	1934.
Total	11,033	14,350
Acids	1,872	2,842
Cobalt oxide and salt	390	436
Fertilisers	2,959	3,785
Paints and varnishes	374	600
Soap	395	914
Soda and compounds	2,713	3,260
Medicinal drugs	818	797

The total imports of chemicals and allied products increased only $4 millions last year. Several items, including acids, cellulose products, drugs and medicines,dyeing and tanning materials, paints and varnishes, contributed to the total increase.

Details of Imports from the United Kingdom.

Canadian imports from the United Kingdom in the calendar year 1934 total approximately $113½ millions compared with a little less than $98 millions in the previous year, and $93½ millions in 1932. Details of imports of chemical and allied products from the United Kingdom are as follows:

	(*Thousands of Dollars.*) 1932.	1934.
Total	4,719	6,165
Acids	230	351
Cellulose products	89	114
Dyeing and cleaning materials	418	668
Paints and varnishes (including zinc white, lithophone, litharge, etc.)	768	1,175
Potash and compounds	95	131
Soda and compounds	683	844
Drugs and medicines	875	792
Perfumery	166	89
Soap	101	68

In the calendar year 1934, the total imports of chemicals, etc., were $28 millions, of which $16½ millions came from the United States and $6 millions from the United Kingdom. The principal imports from the United Kingdom to show increases last year were: Acids, $350,583; nitrate of ammonia, 3,451,216 lb. a very substantial increase compared with 1933; dyeing and tanning chemicals, $667,873; explosives, $19,198; glycerine, 1,533,876 lb., which is nearly twenty times the volume exported last year; chemicals for paints and varnishes, $1,175,481; potassium compounds, 917,849 lb., approximately three times the trade of last year; cream of tartar, 471,188 lb.; sodium compounds, 26,389,869 lb., a substantial gain compared with 1933. A loss of trade was experienced in cellulose products, chloride of lime, medicinal preparations, preparations for spraying and perfumery.

The Canadian imports of chemicals, etc., from the United Kingdom increased in 1934, ,compared with the previous year, about $1 million.

A total of 696 establishments engaged in the manufacture of chemicals and allied products reported in 1933 production valued at nearly $93 millions. Official statistics for 1934 are not available. Acids, alkalies and salts, or the heavy chemical industry, advanced 12 per cent. to $12¾ millions; the wood distillation industry gained 10 per cent. to $669,120; fertilisers, 7 per cent. to $4¼ millions; adhesives, 5 per cent. to $1 million, and explosives, 2.7 per cent. to $7¼ millions. The medicinal and pharmaceutical industry, which was the most important of the group, declined 2.9 per cent. to $17 millions; paints, standing second in importance, showed only a slight recession to $14,896,693, from $14,912,383, and the soaps, washing compounds and cleaning preparations industry, which was third in point of value, declined 3.2 per cent. to $14¼ millions. The coal tar distillation industry dropped 21 per cent. to $1½ millions; toilet preparations, 7.9 per cent. to $5½ millions; inks, 2.2 per cent. to $2 millions; polishes, 1.8 per cent. to $1¾ millions; compressed gases, 0.5 per cent. to $2½ millions, and the miscellaneous industry, 14 per cent. to $6¾ millions.

New Developments

A number of notable additions were made last year to the list of chemicals and allied products made in the Dominion. Brunner Mond (Canada), Ltd., have erected and equipped a plant at Amherstburg, Ontario, for the manufacture of a Canadian supply of calcium chloride; the Electric Reduction Co., of Buckingham, has commenced to make tri-sodium-phosphate, di-sodium-phosphate and sodium chlorate; while Canadian Industries, Ltd., began to manufacture ferric chloride and sulphur mono-chloride at Sandwich, Ontario, and hydrogen peroxide at Shawinigan Falls, Quebec.

In the realm of products already established in Canada, the Consolidated Mining and Smelting Co., Ltd., of Trail, B.C., commenced to make zinc dust last year, while Shawinigan Chemicals, Ltd., have made great progress in the field of synthetic resins. Addtionally, Canadian Industries, Ltd., found the year propitious to erect two new factories; a caustic-chlorine works at Cornwall, Ontario, which is the centre of the pulp and paper and rayon industries, both of which are important consumers of caustic soda and liquid chlorine; and a commercial explosives works at East Selkirk, Manitoba, to take care of the growing market provided by the mining developments in that area.

Paints and Varnishes

The imports of paints, pigments and varnishes annually is about one-sixth the value of the production in the Dominion. Several United Kingdom firms have established connections overseas and at least two have branch works for the production of paints in Canada. Expansion of United Kingdom exports in face of those conditions is obviously difficult. The total imports of paints and varnishes, etc., in the calendar year 1934, were valued at $3,292,956, of which $1,175,481 came from the United Kingdom and $1,827,532 from the United States. Some of the main items of import were:—

		From United Kingdom.	*From United States.*
Carbon black	(lb.)	15	11,571,421
Lithopone	(lb.)	6,227,543	3,405,904
Oxides	(lb.)	1,171,439	4,345,815
Ready mixed paints	(lb.)	25,171	94,216
Varnish	(lb.)	11,861	65,728
Zinc white	(lb.)	9,908,021	1,251,705

The production of paints and colours in Canada in a recent year (1933) includes the following: Dry colours, 3½ million lb.; colours ground in oil or japan, 1¼ million imperial gal.;

cold water paints, 7 million lb.; paste paints, 3¼ million lb.; ready mixed paints, 2¼ million imperial gal.; oil and spirit varnishes, 1¼ million imperial gal.

Production by the concerns in Canada which were engaged chiefly in making patent and proprietary medicines, pharmaceuticals and similar commodities was valued at $17,063,849 in 1933, compared with $17,573,979 in 1932 and $18,110,794 in 1931. Official figures are not at present available for any year later than 1932. Whilst the United Kingdom, however, supplies to Canadian manufacturers many of the products for making patent and proprietary medicines, its exports to Canada of patent medicines are relatively small on account of local production.

A small amount of trade in gums and resins is being done by the United Kingdom although since the Ottawa Conference, an improvement has occurred in a limited range including shellac. The total imports last year were 40,718,291 lb. which is almost double the imports of 1932. The United Kingdom's share was 750,759 lb. and the United States obtained 34,756,482 lb. A great deal of this trade is done through New York and Mr. Field says that persistent efforts will be required to divert a larger portion of it through United Kingdom channels.

Production of petroleum in Canada increased substantially in 1934, the total being 1,417,368 barrels and for 1933, 1,145,333 barrels. Almost the whole increase was due to enlarged production of naphtha in the Turner Valley, Alberta, which rose from 968,055 barrels in 1933 to 1,227,486 barrels in 1934. Drilling continued on a fairly extensive scale but, with the exception of the wet gas wells which furnish the naphtha, no crude oil field of importance has yet been discovered. During the year the Lloydminster Gas Co. brought in the first large gas well in Saskatchewan. The well was completed on March 30 with an initial flow of 16¾ m.c.f. per day. The projected refinery for treating Alberta sands is still under consideration. Further experimental work financed by United States capital will probably be undertaken during the coming summer.

An interesting development took place in Nova Scotia, followed by New Brunswick, Prince Edward Island and Alberta, in the shape of an Act to control the dispensation of gasoline (petrol) within the confines of each province. This legislation helps the industry by the elimination of added costs caused by intensive competition, but retards the development of the market to some extent, particularly by a company not already operating within the province.

The Shell Oil Co. of Canada, Ltd., and other refiners made good progress during the year. The outlook for 1935 is reported by Canadian refineries as being encouraging. The sales of gasoline in 1935 will probably exceed 500 million gal. and may reach 520 million gal. The United Kingdom industry is not interested in exports to Canada.

The Water Gas Process

Further Experiments at the Fuel Research Station

FURTHER experiments upon the water-gas process are reported in Fuel Research Technical Paper No. 43 (H.M. Stationery Office, 1s. net). Previous reports (Technical Papers Nos. 27 and 30) have described methods for the measurement of rapidly fluctuating flows of gas and for the preparation of carbon and thermal balances in connection with the water-gas process. The present report deals with the application of these methods to the study of important variables in the process.

In beginning this investigation it was realised that the accumulation of masses of clinker in the generator, though an extraneous factor in relation to the actual water-gas process, could nevertheless so influence the efficiency of the plant as to mask the effects of altering any of the true variables. The first part of the work covered by this report was therefore directed to finding conditions under which the generator could be worked with entire avoidance of clinker formation. This end was successfully achieved by simple modifications of the plant and the method of operation. These modifications resulted in a reduction of about 50 per cent. in the output, and, though this was offset to some extent by an increased thermal efficiency of 20 per cent., they would seldom be adopted in industry. In overcoming the masking effect just referred to, however, the expedient was in the present instance justifiable.

Examination of Variables

The variable effects of clinker formation having been eliminated, attention was turned to examining the effects of certain true variables, *viz.*, the rate of blowing, the size of the coke, and the nature of the coke. Each of these was varied independently of the others and its effect was assessed by carrying out trial runs for which full data were recorded and thermal and carbon balances prepared.

Experiments on the rate of blowing showed that for the greatest thermal efficiency during the blowing period the rate of blowing should be as high as practical limitations allow, which is normally that at which pieces of coke would be projected from the generator. To ensure that the temperature of the coke bed at the end of the blowing period did not exceed the optimum, however, the time of blowing was correspondingly decreased. In this way the percentage of carbon monoxide in the blow gas was reduced to a minimum and other thermal losses were also reduced.

Alteration of the size of the coke fed to the generator was shown to have only a slight effect upon the thermal efficiency of the process and the output of the plant, provided that the conditions of operation—in particular the time and rate of blowing—remained unchanged. Owing to the greater surface area of small coke, however, a decrease in size resulted in a lowering of the working temperature, and if the volume of air per blow period were increased to bring the temperature up to the normal level for larger coke the output of water-gas could be greatly increased. This increased output, unless the rate of blowing could be made high enough (still avoiding projection of coke from the generator), must be at the expense of the thermal efficiency, but in cases where coke breeze is cheap the increase of output may outweigh the loss of efficiency.

Reactivity Tests

The effect of the nature of the coke was investigated by using three cokes produced from the same coal under different carbonising conditions. The first, representing the standard type of low-reactivity coke used in the water-gas process, was a horizontal gas retort coke; the second was produced at a somewhat lower temperature in vertical gas retorts; and the third was a low-temperature coke of high reactivity. It was evident that the heat treatment to which the coke was subjected in the upper part of the generator would tend to level out any differences that may have existed between the original cokes, and the results show that in the water-gas reactions the vertical and horizontal gas retort cokes behaved in a very similar manner. The low-temperature coke, however, showed appreciable differencess due to its greater reactivity to carbon dioxide during the blow period and its higher content of volatile matter.

Personal Notes

MR. F. J. TALBOT, chairman of Ibbotson Bros. and Co., Ltd., of Globe Steelworks, Sheffield, died on January 23.

MR. D. D. MCRAE, Broompark, Denny, managing director of Robert Benny, Ltd., chemical manufacturers, has died in his 82nd year.

MR. H. A. HOLMES, chairman of the India Tyre and Rubber Co., Ltd., and a director of Selfridges, Ltd., has been elected to a seat on the board of the Crittall Manufacturing Co., Ltd.

SIR ERNEST BENN'S new work, "Modern Government," is to be published by George Allen & Unwin, Ltd., on March 10, and booksellers are now in a position to take orders for the first edition.

MR. E. M. MYERS, after nine years' service as a fuel technologist with Dorman Long and Co., has been appointed sales manager for the Charlaw and Sacriston Coal Co. Mr. Myers has had a wide experience of the coking industry and is a past-president of the Coke Oven Managers' Association.

MR. BASIL HEASTIE, M.INST.C.E., M.I.CHEM.E., has recently joined the board of Asbestos and Engineering Products, Ltd., in order to extend and develop the chemical plant side of the business. Mr. Heastie is a well-known authority on the subject of heat transfer and its various applications.

DR. EZER GRIFFITHS and MR. R. W. POWELL, of the National Physical Laboratory, Teddington, have been awarded the Moulton Gold Medal of the Institution of Chemical Engineers for 1935 for their paper on "The Evaporation of Water from Plane and Cylindrical Surfaces" which they presented at a meeting of the Institution on November 20 (reported in THE CHEMICAL AGE of November 30). The medal is in memory of the scientific services rendered during the war by the late Lord Moulton. Dr. Griffiths was born at Aberdare in 1888 and educated at the University College, Cardiff. He held a fellowship of the University of Wales

Dr. Ezer Griffiths.

Mr. R. W. Powell.

and joined the staff of the National Physical Laboratory in 1914, and is now graded as a principal scientific officer. He is hon. business secretary of the Physical Society and recorder of Section A of the British Association. He has written a number of books on temperature measurements. Mr. R. W. Powell is 32 years of age and has been engaged in research work at the National Physical Laboratory for the past 11 years. He was educated at Erith County School and at University College, London, where he graduated as a B.Sc. with first-class honours in physics. In addition to the present research on evaporation, he has also been the author of papers dealing with the thermal and electrical conductivities of metals and alloys at high temperatures, and has worked in collaboration with Dr. Griffiths on other investigations, including that relating to the distribution and measurement of air discharge from dust systems.

MR. JOSEPH COOK, a former manager of the Butterley Co.'s ironworks at Codnor Park, has died.

MR. A. E. C. SINGER, chemist, formerly a director of I. C. Dyestuffs, Ltd., left £13,144, with net personalty £12,399.

MR. J. BLAIR, B.SC., of the Clayton Aniline Co., gave a lecture at the Leathersellers' College on January 29 on "Dyestuffs and Dyeing."

MR. W. C. YOUNG, F.I.C., F.C.S., of Aldgate, London, an analytical chemist, left £20,000, with net personalty £18,591.

MR. W. BUTTERWORTH, M.A., J.P., of Cheshire, chairman of Butterworth Bros., Ltd., glass manufacturers, left £12,680, with net personalty £9,743.

LORD RUTHERFORD has been appointed director of the Royal Society Mond Laboratory at Cambridge University, in place of Professor N. P. Kapitza.

SIR J. BARCROFT, professor of physiology at Cambridge University, will deliver the Huxley Lecture of the University of Birmingham on February 25. His subject will be "The Influence of Chemical Conditions on Mental States."

DR. J. SWORD, chief chemist at the Scottish C.W.S. Regent Flour Mills, Glasgow, gave an address at Leith last week to a large audience of bakers and managers on the subject of fermentation.

DR. A. P. ALLEN, president of the Birmingham Metallurgical Society, presented the students' prizes at the annual dinner on January 23. H. J. MERCHANT received the Society's bronze medal for an essay on "Steel Sheets," and S. C. CRATHORN for a paper on "Analytical Research."

MR. J. D. BELL, B.A., B.SC., has been appointed lecturer in biochemistry at Cambridge University for three years from February 1; MR. E. H. F. BALDWIN, B.A., PH.D., has been appointed demonstrator in biochemistry, the appointment dating from January 1.

PROFESSOR R. ADAMS, immediate past-president of the American Chemical Society, has been awarded the Willard Gibbs Medal for his work on catalysis and stereochemistry of diphenyl derivatives. Professor Adams is in the first rank of organic chemists. His contributions to the literature of the subject have been extensive and diverse, including organic mercury and arsenic compounds, stereochemistry, local anesthetics, alkaloids, X-ray studies of organic compounds, and others.

ALDERMAN ROBERT H. HUME, of Edgbaston, Birmingham, chairman of Cuxson, Gerrard and Co., Ltd., manufacturing chemists, of Birmingham and Oldbury, died under tragic circumstances on January 25. He was knocked down by a motor car near his home late on the previous Tuesday night, and at the inquest on Wednesday a verdict of accidental death was returned. A pathetic circumstance was that the Alderman was to have been married on Wednesday—the day of the inquest. He was one of the best-known public men in Birmingham, having been a member of the City Council since 1920. He was chairman of the gas committee and previously for a short time had been chairman of the education committee. During the war he was chairman of a company at Derby, which provided spirit for the manufacture of explosives and munitions. Before going into business he was on the teaching staff of King Edward's Foundation, Birmingham.

INCREASED interest has been manifested in cultivation of derris in the Federated Malay States. Apart from numerous Chinese-owned small plots, there are 715 acres under cultivation on a few large estates. Prices of roots for export have increased about 75 per cent. since early 1934, owing to active demands of insecticide manufacturers in the United Kingdom, United States and Japan.

Continental Chemical Notes

Czechoslovakia

FROM A DUTCH SOURCE is published the report of a Czechoslovakian project for coal hydrogenation with financial participation of a Dutch group.

Russia

A METHOD FOR PURIFYING TUNGSTIC ACID by removing molybdenum compounds is based upon conversion into the ammonium salt and treatment of the latter with hydrochloric acid in quantity equivalent to 50 to 70 per cent. of that required for complete precipitation of the tungstic acid. The mother liquor is treated in the same manner (Russian Patent 40,341).

France

RECENT COMPANY FORMATIONS include: Etudes et Recherches scientifiques, Paris (capital 100,000 francs) for manufacture of all types of chemical preparations; Soc. des Produits colorantes et plastiques, Colombes (Seine) (capital 625,000 francs), for manufacture of plastic masses; Compagnie des Schistes bitumineux de Vagnas, Paris (capital 10 million francs), for exploitation of shale, peat and lignite deposits.

Poland

THE PREPARATION OF PHOSPHORUS NITRIDE (P_3N_5) by Stock's method has been found by Postnikov and Kouzmine to be practicable on the laboratory scale but not on the industrial scale. Describing the properties of this relatively novel product, the investigators report that it is not dissolved or decomposed by boiling water. In a sealed tube, however, in the presence of water, decomposition takes place quantitatively at 250° C. with formation of ammonia and phosphoric acid. Under ordinary pressure the nitride can be dried in the air at 120° C. without any risk of explosion since it does not decompose below 800° C. Hydrochloric acid and dilute nitric acid, also caustic alkalies, do not attack phosphorus nitride, while it is only slowly decomposed by concentrated nitric acid and dilute sulphuric acid. On the other hand it reacts rapidly with hot concentrated sulphuric acid with formation of ammonia and phosphoric acid. This unusual stability to most chemical reagents under normal conditions precludes its direct use as a fertiliser although it can be readily transformed into assimilable fertilisers ("J. Prikl. Khim.," 1935, p. 429).

Germany

AN OCCUPATIONAL DISEASE characterised by injury to the liver has been reported among workers engaged in the conversion of paraffin wax into olefines by a cracking process. According to K. Kotzing ("Chem.-Zeitung," January 1), the trouble can be remedied by a fat-poor diet and administration of grape sugar and insulin.

ANNOUNCEMENT HAS BEEN MADE of the formation of the first German whaling company under participation of Persilwerke Henkel and Cie. Orders have been placed for the construction of five modern whalers, in addition to a factory ship, reports "Chemische Industrie," and the first expedition will probably start in the 1936-37 whaling season.

ALUMINIUM CARBIDE (Al_4C_3) is now readily prepared in a dark-orange form by heating very pure aluminium turnings with the theoretical amount of ash-free carbon in a completely enclosed carbon crucible in a nitrogen-free hydrogen atmosphere. The process is operated at a temperature of 2,000 ° C. for 30 minutes under a pressure equivalent to one atmosphere. Carbon of requisite purity is prepared from old carbon rods used as heating resistances in electric furnaces, these being extracted with boiling hydrochloric acid and washed and dried ("Chem.-Zeitung," January 4).

SEPARATION OF ZINC OXYCHLORIDE from solutions of zinc chloride can be avoided by preliminary addition to the water of alkaline chlorides or other substances forming soluble and crystallisable double salts with zinc chloride. This method is not practicable in pharmaceutical work where the following alternative method is recommended by Sido ("Pharm. Ztg.," 1935, p. 789). Starting with a 50 per cent. stock solution of pure fused zinc chloride, the appropriate quantity for preparation of any given dilute solution is withdrawn and diluted with freshly boiled water acidulated with just enough hydrochloric acid to prevent formation of the basic salt. This method is tantamount to a reversal of the reaction: $2ZnCl_2 + H_2O = 2HCl + ZnCl_2.ZnO$.

Far Eastern Chemical Notes

China

CAMPHOR IS USED AS THE CATALYST in a new method for preparing sulphuryl chloride from sulphur dioxide and chlorine described by Tseng and Sze ("Sc. Quart. Nat. Univ. Peking," 1935, p. 344). Ten grams of pure dextrorotary camphor are placed in a 500 c.c. ice-cooled flask and a stream of sulphur dioxide is passed through for an hour, followed by a stream of chlorine for the same time. Passage of the two gases is then repeated in the same order for 30 minutes each. Finally, both gases are simultaneously introduced until no more is absorbed by the liquid in the flask. About 24 hours in all is required for the process. The contents are distilled on a water bath and the fraction boiling at 68 to 70° C. is collected. After fractionating the distillate to remove traces of camphor, sulphuryl chloride is obtained as a colourless liquid in a yield of 46.1 per cent.

Japan

MANUFACTURE OF SANTONIN is now contemplated by Yamakawa Seyaku K.K., on the basis of Russian raw materials.

LANOLIN IS PRODUCED IN JAPAN on a considerable scale by two concerns: Miyakawa Muslin K.K. (with a planned output for this year of 10,000 kilos) and Hino Seiyakusho of Osaka (with a daily output of 150 kilos). A third concern now entering this field in Osaka (reports "Chemische Industrie") is Kimura Seiyusko K.K.

RICE OIL IS RECOMMENDED as a source of vitamin E (antisterility vitamin) by Yokoyama and Matsuda. The method of isolation involves saponification of the oil and extraction of the unsaponifiable matter with ether. Myricic alcohol (a sitosterol) is separated and distilled under reduced pressure, the fraction coming over between 200 and 250° C. under 1 mm. pressure being said to consist of vitamin E. Evidence in favour of this claim is afforded by molecular weight determinations and biological tests ("J. Soc. Chem. Ind. Japan," 1935, p. 190b).

THE PREPARATION OF SULPHURIC ACID CONTACT CATALYSTS by a new method is detailed by Matsui and Oda ("J. Soc. Chem. Ind. Japan," 1935, p. 148b). Magnesium sulphate crystallised with 1 molecule of water (prepared by dehydration at 100 to 120° C. of the fully hydrated salt) is powdered, mixed with half its weight of water to a paste and evaporated to dryness with vigorous stirring. After final calcination in an electric furnace at 600° C., the product in the form of granules (2.5 to 3.5 mm. diameter) is platinised in platinum chloride solution, the concentration of which is equivalent to 0.1 per cent. platinum. After dehydration in the air at 350° C., the catalyst is activated at the same temperature with a gas containing 2 per cent. sulphur dioxide.

Chemical and Allied Stocks and Shares

Broadening of Interest in Most Sections

Now that the danger of a coal strike has been averted there has been an upward movement in many industrial shares, and dealers have reported a good increase in the volume of business. Various shares of companies connected with the chemical and allied trades participated in the advance, but taken as a whole they show few really important changes on balance for the week, although they have been very firm. British Oxygen were again higher, partly on the knowledge that the company has important developments in hand for further extending the business, and partly on estimates current in the market that the hoped for bonus may take the form of two ordinary £1 units for every five held. Staveley Coal and Iron also show a good rise on the week, largely owing to the view that the various departments of the business, including by-products, are doing well and that profits are probably running at a higher level. For the year to June 30 last net profits were £316,289 (against £264,774) and the dividend was increased from 6 per cent., tax free, to 8 per cent., tax free. The interim dividend for the current year will probably be announced towards the end of February. William Blythe 3s. ordinary shares, market views in connection with which were mentioned last week, have moved up further from 7s. 1½d. to 7s. 4½d. at the time of writing. There was also increased interest shown in British Cyanides and these 2s. shares have put on 4½d. to 3s. 6d. The market believes that the company's various activities have scope for considerable expansion as time proceeds, and that if, as is hoped, some of them have reached the stage where they are contributing a good deal more fully to profits, a larger dividend is quite possible. For the previous year 8 per cent. was paid, and this represented a conservative distribution of profits. Fison, Packard and Prentice have kept steady at 45s. 7½d. and Cooper, McDougall and Robertson were also unchanged and steady. The last-named company, in common with others with important business in the Argentine, should benefit if the new Anglo-Argentine trade agreement bears out hopes of securing exchange and other concessions for British companies. United Molasses remained prominent, on the possibility of an interim dividend if the improvement in tanker freight rates is held. Goodlass Wall and Lead Industries have retained their recent good rise to 15s., there being continued hopes in the market that an increase in the dividend to 7½ per cent. is possible. Pinchin Johnson also held up quite well, current dividend estimates suggesting prospects of a 20 per cent. total dividend for the year, an increase of 2½ per cent. There has been a rally in Imperial Chemical from 36s. 10½d. to 38s. at the time of writing. The market remains confident that maintenance of the dividend at 8 per cent. is likely. Lever Brothers' preference issues made higher prices, as did Unilever and Unilever N. V. ordinary. Boots Pure Drug 5s. ordinary were again higher on balance on the talk in the market that shareholders are likely this year to participate to a larger extent in the company's prosperity. A point of interest was the recent marking of business at the higher price of 33s. in the £1 ordinary shares of the Fullers' Earth Union. At Birmingham more interest again attached to the £1 ordinary shares of United Water Softeners which are 26s., compared with 25s. 6d. a week ago. If last year's course is followed the results will be issued in March. Borax Consolidated deferred have recovered their recent moderate decline. Salt Union were a few pence higher at 47s. 6d. and Associated Portland Cement ordinary were in good request. In addition to expectations that larger dividends are in prospect, market talk suggests the possibility of both companies distributing some form of bonus as time proceeds. International Nickel were active in common with many other shares which have a market on both sides of the Atlantic. Reckitt and Sons' ordinary were very firm. The quarterly dividends have been maintained at the usual rates, and if last year's course is followed the total payment for the year will be brought up to 22½ per cent. Anglo-Iranian and other leading oil shares have been prominently active and have moved up further.

Name.	Jan. 27.	Jan. 14.
Anglo-Iranian Oil Co., Ltd. Ord.	84/4½	79/1½
,, 8% Cum. Pref.	36/9	37/-
,, 9% Cum. Pref.	38/-	38/-
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	5/6¾	5/6¾
Associated Portland Cement Manufacturers, Ltd. Ord.	72/6	70/-
,, 5½% Cum. Pref.	28/-	28/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	67/6	66/3
Bleachers' Association, Ltd. Ord.	7/6	6/10½
,, 5½% Cum. Pref.	11/3	12/2½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	55/3	53/9
Borax Consolidated, Ltd., Pfd. Ord. (£)	110/-	107/6
,, Defd. Ord.	21/3	22/6
,, 5½% Cum. Pref. (£10)	£11/15/-	£11/15/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£107	£107
,, 4½% 2nd Mort. Deb. Red. (£100)	£103/10/-	£103/10/-
Bradford Dyers' Association, Ltd. Ord.	9/4½	8/9
,, 5% Cum. Pref.	12/6	13/1½
,, 4% 1st Mort. Perp. Deb. (£100)	£87/10/-	£87/10/-
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/3	25/9
,, 7½% Part. 2nd Cum. Pref.	23/6	23/9
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/3	6/3
,, 4% 1st Mort. Deb. Red. (£100)	£96	£94
British Cyanide Co., Ltd. Ord. (2/-)	3/6	3/1½
British Drug Houses, Ltd. Ord.	18/1½	18/1½
,, 5% Cum. Pref.	21/10½	21/10½
British Glues and Chemicals, Ltd. Ord. (4/-)	8/1½	8/1½
,, 8% Pref. (Cum. and Part.)	28/9	28/9
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
,, 5½% Cum. Pref.	25/7½	25/7½
,, 4½% First Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	126/3	120/-
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	87/6	85/-
,, 6% Cum. Pref.	30/6	30/6
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£102/10/-

Name.	Jan. 27.	Jan. 14.
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	112/6	112/6
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	9/4½	8/9
,, 5% Pref. (Cum.)	14/8½	15/7½
Cellulose, Acetate Silk Co., Ltd. Ord.	14/8½	14/8½
,, Deferred (1/-)	2/10½	2/10½
Consett Iron Co., Ltd. Ord.	11/3	11/-
,, 8% Pref.	31/3	31/3
,, 6% First Deb. stock, Red. (£100)	£108/10/-	£107
Cooper, McDougal & Robertson, Ltd. Ord.	40/-	40/-
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	60/-	59/4½
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	31/10½	31/10½
,, 7½% "A" Cum. Pref.	30/-	30/-
Distillers Co., Ltd. Ord.	99/-	100/-
,, 6% Pref. Stock Cum.	31/6	31/6
Dorman Long & Co., Ltd. Ord.	20/9	21/3
,, Pref. Ord.	32/6	31/10½
,, 6½% Non-Cum. 1st Pref.	23/3	23/-
,, 8% Non-Cum. 2nd Pref.	24/-	24/-
,, 4% First Mort. Perp. Deb. (£100)	£103/10/-	£101/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£105/10/-	£106/10/-
English Velvet & Cord Dyers' Association Ltd. Ord.	4/4½	4/4½
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£72/10/-	£72/10/-
Fison, Packard & Prentice, Ltd. Ord.	45/7½	45/7½
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	27/6	27/6
,, 3½% Maximum Stock (£100)	£90/10/-	£90/10/-
,, 4% Consolidated Pref. Stock (£100)	£108/10/-	£108/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£91/10/-	£90/10/-
,, 5% Deb. Stock Red. (£100)	£117/10/-	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£114/10/-	£114/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	15/-	14/4½
,, 7% Prefd. Ord. (10/-)	13/9	13/9
,, 7% Cum. Pref.	28/9	28/9

Name.	Jan. 27.	Jan. 11.
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	37/9	37/-
,, Deferred (10/-)	9/3	9/-
,, 7% Cum. Pref.	34/-	34/-
Imperial Smelting Corporation, Ltd. Ord.	15/6	15/9
,, 6½% Pref. (Cum.)	25/7½	25/-
International Nickel Co. of Canada, Ltd. Cum.	$40½	$46¼
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	130/-	128/9
Lawes Chemical Co., Ltd. Ord. (1/-)	6/3	6/3
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	33/-	32/3
,, 8% Cum. "A" Pref.	33/9	33/6
,, 20% Cum. Prefd. Ord.	80/-	78/1½
,, 5% Cons. Deb. (£100)	£108/10/-	£107/10/-
,, 4% Cons. Deb. (£100)	£106/10/-	£105/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£40	£40
Major & Co., Ltd. Ord. (5/-)	7¾d.	7¾d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾

Name.	Jan. 27.	Jan. 11.
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	44/-	42/6
,, 1st Pref. 6½% Cum.	32/-	32/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£72	£72
Reckitt & Sons, Ltd. Ord.	118/9	115/7½
,, 4½% Cum. 1st Pref.	24/4½	24/4½
Salt Union, Ltd. Ord.	47/6	47/6
,, Pref.	47/6	47/6
,, 4½% Deb. (£100)	£107/10/-	£107/10/-
South Metropolitan Gas Co. Ord. (£100)	£134/10/-	£134/10/-
,, 6% Irred. Pref. (£100)	£150/10/-	£150/10/-
,, 4% Pref. (Irred.) (£100)	£107	£107
,, Perpetual 3% Deb. (£100)	£88/10/-	£88/10/-
,, 5% Red. Deb. 1950-60 (£100)	£114/10/-	£114/10/-
Staveley Coal and Iron Co., Ltd. Ord.	41/3	47/6
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	90/7½	88/1½
Unilevers, Ltd. Ord.	32/6	32/6
,, 7% Cum. Pref.	30/9	30/3
United Glass Bottle Manufacturers, Ltd. Ord.	42/6	40/-
,, 7½% Cum. Pref.	32/6	32/6
United Molasses Co., Ltd. Ord. (6/8)	27/6	25/-
,, 6% Cum. Pref.	26/3	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	10/9	10/6
,, 7% Cum. Pref.	25/-	25/-
,, 4¾% Deb. Red. (£100)	£101/10/-	£101/10/-

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

PLASTIC MASSES, manufacture.—I. G. Farbenindustrie. July 7, 1934. 19470/35.

LUBRICANTS.—Continental Oil Co. July 7, 1934. 19505/35.

CHLOROPYRENEQUINONES, manufacture.—Soc. of Chemical Industry in Basle. July 7, 1934. 19528/35.

PREPARATIONS CONTAINING VITAMIN, manufacture.—I. G. Farbenindustrie. July 12, 1934. 19611/35.

SOFTENING TEXTILES, process.—Soc. of Chemical Industry in Basle. July 9, 1934. 19629/35.

IMPROVING LUBRICATING OILS, process.—Ruhrchemie A.-G. July 10, 1934. 19657/35.

3 : 5 : 8 : 10-TETRA-AROYLPYRENES, manufacture.—Soc. of Chemical Industry in Basle. July 11, 1934. 19862/35.

FAST DYEINGS ON THE FIBRE, process for producing.—Soc. of Chemical Industry in Basle. July 12, 1934. 19959/35.

BUTYL ALCOHOL FERMENTATION PROCESS.—Commercial Solvents Corporation. July 12, 1934. 20008/35.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. July 7, 1934. 692/36.

Specifications Accepted with Date of Application

COATINGS OR FILLINGS, process for producing.—W. W. Groves (I. G. Farbenindustrie). July 3, 1934. 440,889.

PHENOL-FORMALDEHYDE CONDENSATION PRODUCTS, manufacture.—L. Nash and J. C. Vredenburg. July 4, 1934. 440,959.

ACRIDINE DERIVATIVES, process for manufacture.—I. G. Farbenindustrie, Dr. F. Mietzsch and Dr. H. Mauss. July 5, 1934. 441,007.

ORGANIC ESTERS, manufacture and use.—British Celanese, Ltd. July 12, 1933. 440,962.

MEDICAMENTS, manufacture.—I. G. Farbenindustrie. July 8, 1933. 440,963.

SOLID DIAZONIUM SALTS, manufacture.—I. G. Farbenindustrie. July 7, 1933. 440,964.

POLYMERISATION PRODUCTS, manufacture and production.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 9, 1934. 441,064.

PURIFYING OR REFINING PROCESS for sulphate or soda cellulose. Uddeholms Aktiesbolag. July 7, 1933. 440,965.

METHACRYLAMIDE, METHACRYLIC ACID and derivatives thereof, production.—J. W. C. Crawford, J. McGrath and Imperial Chemical Industries, Ltd. July 9, 1934. 440,967.

SALTS OF AROMATIC AMINOALCOHOLS, manufacture.—G. B. Ellis (Dr. K. Merck, L. Merck, W. Merck and F. Merck (trading as E. Merck (firm of)). July 9, 1934. 440,968.

CELLULOID AND LIKE BALLS, manufacture.—J. Jaques and Son, Ltd., and J. M. Jaques. July 10, 1934. 441,015.

CONDENSATION PRODUCTS, process for manufacture.—I. G. Farbenindustrie. July 12, 1933. 441,016.

MERCERISING LIQUORS, process for enhancing the wetting capacity.—W. W. Groves (I. G. Farbenindustrie). July 11, 1934. 441,070.

SECONDARY DISAZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and A. H. Knight. July 11, 1934. 441,072.

INTERMEDIATES FOR AZO DYES, manufacture.—E. I. du Pont de Nemours and Co. July 12, 1933. 441,079.

Applications for Patents

(January 1 to 8 inclusive.)

CARBONISATION OF CARBONACEOUS MATERIALS, controlling.—G. W. Wallace. 593.

(January 9 to 13 inclusive.)

DYESTUFFS OF THE PHTHALOCYANINE SERIES, manufacture.—A. Carpmael (I. G. Farbenindustrie). 800.

WATER-INSOLUBLE AZO DYESTUFFS and printing preparations, manufacture.—A. Carpmael (I. G. Farbenindustrie). 1122.

HETEROCYCLIC CONDENSATION PRODUCTS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 1123.

ALKALI HYPOCHLORITE PREPARATIONS, manufacture.—W. Clayton. 835.

ANILINE DERIVATIVES, manufacture.—S. Coffey. 1361.

ALDEHYDES, manufacture.—E. I. du Pont de Nemours and Co. (United States, Jan. 9, '35.) 831.

ESTERS OF METHACRYLIC ACID and their manufacture.—E. I. du Pont de Nemours and Co., E. F. Izard and G. D. Graves. 922, 1214.

EXTRACTION OF VOLATILE HYDROCARBONS from solid or high boiling point liquid hydrocarbons.—N. H. Freeman. 825.

N-DIARYL DITHIOCARBAMATES OF METALS, formation.—B. F. Goodrich Co. (United States, Aug. 10, '35.) 887.

PHTHALOYL- (N-DIHYDRO)-AZINES and derivatives thereof, manufacture.—W. W. Groves (I. G. Farbenindustrie). 1086.

ANILINE DERIVATIVES, manufacture.—N. H. Haddock and Imperial Chemical Industries, Ltd. 1361.

DE-ACIDIFYING WATER, process.—F. Hähn. (Germany, Jan. 16, '35.) 1355.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 16, '35.) 1087.

MAGNESITE BRICKS, production.—Magnesit-Industrie A.-G. (Austria, Jan. 10, '35.) 797.

REFINING TREATMENT of cracked distillates.—A. L. Mond (Universal Oil Products C.). 1023.

From Week to Week

THE ANNUAL DINNER-DANCE arranged by the Midland Chemists' Committee, which was to have been held to-day (Saturday) at the Midland Hotel, Birmingham, has been postponed until February 29.

DAMAGE ESTIMATED AT £2,000 was caused when fire broke out on January 27 in a drying room at the factory of W. J. and T. Lambert and Co., Ltd., bleachers, dyers, and dressers, Talbot Street, Nottingham.

THE IRISH FREE STATE imported chemicals, drugs, perfumery, dyes and colours to the value of £1,047,499 in 1935, as compared with £1,054,579 in the previous year. In addition chemical fertilisers valued at £413,879 were imported last year, against £318,173 in 1934.

THE DEPARTMENT OF OVERSEAS TRADE announces the cancellation, out of respect for the memory of His late Majesty King George V, of the banquet which, by the courtesy of the Lord Mayor, was to have been given by the Government at the Mansion House on February 17 to mark the opening of the British Industries Fair of 1936.

THE BUSINESS OF HAY, STEVEN AND CO., chemical manufacturers, Maryhill, Glasgow, of which firm the late Mr. Gilbert Beith Hay was sole partner, has been sold to Mr. Andrew Steven, who is to carry on the business under the firm name of Hay Steven and Co., Kelvindock, Maryhill. The office address of the company is now 73 Robertson Street, Glasgow.

PUBLIC SITTINGS of the Royal Commission on the Private Manufacture of and Trading in Arms will be held on Wednesday, Thursday and Friday, February 5, 6 and 7, when evidence will be taken from Imperial Chemical Industries, Ltd., Hadfields, Ltd., Thomas Firth and John Brown, Ltd., William Beardmore and Co., Ltd., Birmingham Small Arms Co., Ltd., the Soley Armament Co., and the Society of British Aircraft Constructors, Ltd.

WEST CALDER GUNPOWDER WORKERS have had their services dispensed with, Imperial Chemical Industries, Ltd., having now decided to concentrate all the manufacture of gunpowder for coal and shale mining at its Ardeer works in Ayrshire. When the West Calder gunpowder works were taken over the West Calder workmen were conveyed daily to Roslin works, but a number of these have now been given work at Ardeer. It is understood that the Roslin works will not be dismantled.

THE ANNUAL STAFF DANCE, organised by a committee of the staff of the National Fire Protection Co., Ltd., was held at the Castle Hotel, Richmond, on January 17. Some 250 members and friends were present, including fire brigade officers and a number of business associates. Dancing began at 8 p.m. and continued to 2 a.m. with a programme of cabaret turns interspersed. These included speciality dancing, a comedian, a crooner, a song from a fire officer and a trio by the directors of the company. Dancing continued in full swing until the last possible moment, when the hosts and guests parted with reluctance, expressions of goodwill and a promise of an even larger gathering next year.

IT IS HOPED TO PASS through both Houses of Parliament this spring the Caledonian Water Power Bill for the development of water resources in the Fort William district of Scotland, which will involve the expenditure of £3,000,000 in construction work during the next few years. The scheme originated with the growing demand for carbide, a commodity of essential importance in many heavy industries. All industries using carbide are dependent almost wholly on foreign supplies and it may be taken for granted that the Import Duties Advisory Committee, which has in the past three years surveyed the position of all industries in this country, has taken more than passing note of the position of dependence on imports from abroad. Like aluminium and other metals and chemicals, carbide cannot be produced at an economic price without electrical power at an exceptionally low cost of generation. Even the Central Electricity Board, with its command of bulk supplies of electricity, cannot economically sell power at rates as would enable a carbide factory to be established and operated.

THE INSTITUTION OF GAS ENGINEERS, whose Royal Charter of Incorporation was granted by King George V in 1929, has sent the following messages to King Edward VIII (honorary life member of the Institution) and to Queen Mary:—"To the King's Most Excellent Majesty. May it please your Majesty: The council and members of the Institution of Gas Engineers humbly desire to express their deep sorrow upon the death of His Majesty King George and dutifully to offer to your Majesty an assurance of loyalty and devotion on your accession to the throne.—William Moncrieff Carr (president), John Russell Willis Alexander (secretary)." "To Her Most Gracious Majesty Queen Mary. May it please your Majesty: The council and members of the Institution of Gas Engineers respectfully offer to your Majesty and the Royal Family their profound sympathy upon the death of His Majesty King George, whose noble example of devotion to duty will continue to inspire all subjects of their beloved Sovereign.—William Moncrieff Carr (president), John Russell Willis Alexander (secretary)."

THE SPUN PLANT SECTION of the Stanton Ironworks held a dinner on January 25, at which Mr. E. J. Fox, managing director, gave some interesting details concerning the enterprise of the company.

THE SUM OF £1,139 was subscribed by the staff and workers at Ardeer Factory and Nobel House staff (formerly Technical Department), including Research Division, to infirmaries, etc., during 1935.

PRELIMINARY INVESTIGATIONS have shown that the titanium ores from the Ilmen Mountains (Ural) contain a considerable amount of the rare and precious metals, niobium and tantalum. The ore represents a fine fusion of two minerals, ilmenite and ilmenorutile. Tin has also been discovered in the same ores. Thus the ilmen ore represents an interesting combination of four valuable metals—titanium, niobium, tantalum, and tin.

THE IMPORT DUTIES ADVISORY COMMITTEE announces that it has under consideration an application for drawback under Section 9 of the Finance Act, 1932, in respect of soya beans used in the manufacture of hydrogenated soya bean oil. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than February 13, 1936.

A REPRESENTATION HAS BEEN MADE to the Board of Trade under Section 10 (5) of the Finance Act, 1926, for the exemption of allyl paracetaminophenol from Key Industry Duty imposed by Section 1 of the Safeguarding of Industries Act, 1921, as amended by the 1926 Act. Any communication on the subject should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, by February 22.

A PETITION HAS BEEN PRESENTED to the Secretary of State for Scotland seeking a provisional order to incorporate a company with Parliamentary powers by the name of the Caledonian Power Co. The proposed order, which accompanies the petition, declares that electricity generated from water power derived from lochs, rivers, streams and gathering grounds in the Counties of Inverness, Ross and Cromarty, "shall be supplied by the company mainly to the British Oxygen Co., Ltd., or their successors or assigns for utilisation for the purposes of an electro-chemical undertaking to be established near Fort William within the company's area of supply." The capital of the electricity company sought under the bill is £500,000, with power to increase this amount "to such an extent as may be authorised by the Electricity Commissioners." The first directors named in the order are all members of the board of the British Oxygen Co.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

British India.—The Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1, invites tenders for:—16,190 dozen bottles, green, amber and blue, ½ oz. to 4 lb.; also for 101,980 tinned plates; best coke and best charcoal. Sample required with tender. Tenders due February 14, 1936. Forms of tender obtainable from the above at a fee (which will not be returned) of 5s.

Belgium.—An agent established at Lodelinsart wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of tanning materials (other than pigments, dressing for chamois leather and oils), colours for enamelware and glassware. (Ref. No. 77.).

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Egyptian Ministry of Public Works is calling for tenders, to be presented in Egypt by February 27, 1936, for the supply of the following oils:—Cylinder oil for superheated and saturated steam engines; light journal oil for machines; crank, chamber oil for bearing of enclosed high-speed steam engines; extra heavy lubricating oil for diesel engines; lubricating oil for diesel engines, air compressor, dynamo, steam turbines, Ford car; heavy lubricating oil for motor car and gear box; medium lubricating oil for motor car and gear box; light lubricating oil for motor car; heavy medium lubricating oil for diesel engines; yellow and black grease for diesel engines; oil for transformers, circuit breakers and Michael thrust bearing.

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Egyptian Ministry of Public Works is calling for tenders, to be presented in Cairo by February 25, 1936, for the supply of 40,882 kilos of boiled linseed oil; 3,365 kilos raw linseed oil; 1,205 kilos olive oil; 1,953 kilos white tallow; 18,226 kilos turpentine; 2,573 kilos castor oil; 2,452 kilos colza oil. (Ref. T.Y. 226.)

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE prices of a number of coal tar products have been advanced this week, but in general chemical market conditions have remained practically unchanged. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

MANCHESTER.—The course of fresh business has been interrupted to some extent this week by the arrangements for the burial of the late King George, and the chemical market, in common with other sections, was closed on the Manchester Royal Exchange on Tuesday. On the whole, fresh bookings have been only of moderate volume, but the demand from users of chemicals, including textile descriptions, for deliveries against contracts has continued on fairly active lines. The price position remains steady in pretty well every section of the market for heavy products, and neither sellers nor buyers are disposed to look for any change in this respect over the next few months. In the by-products market, pitch and crude and refined tar, as well as the light products and also naphthalene and cresylic acid, maintain a steady front, but the tendency in the case of crude carbolic is easier.

SCOTLAND.—Business in general chemicals has been quieter during the week, both for home trade and export. Prices, however, still remain very steady at about previous figures, with no important changes to report.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £17 15s. per ton. LONDON: Tech., 80%, £33 5s. to £35 5s. per ton; pure 80%, £35 5s. to £37 5s.; tech., 40%, £17 15s. to £19 15s.; tech., 60%, £25 15s. to £27 15s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £37 5s.; tech. glacial, £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. to 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d., less 5%. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—5s. to 5s. 3d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35 10s.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £42 10s.

LITHOPONE.—30%, £16 10s. to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7½d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d. to 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 10s. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON:

4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£31 per ton. SCOTLAND: 3⅝d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5⅝d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—Manchester: £14 15s. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CRESYLIC.—99/100%, 2s. to 2s. 9d. per gal., according to specification; pale 98%, 1s. 10d. to 1s. 11d.; dark, 1s. 6d. to 1s. 7d. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¼d. per lb.; crude 2s. 2d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3⅜d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4⅜d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4⅜d.; light, 4⅜d.; heavy, 4½d. to 4⅝d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 9d.; 90%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £14 10s. per ton; purified crystals, £19 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 2s. 3d. to 2s. 4d. per gal.; pure, 2s. 6d. to 2s. 7d.

XYLOL.—Commercial, 2s. 4d. per gal.; pure, 2s. 6d.

PITCH.—Medium, soft, 43s. to 45s. per ton, in bulk at makers' works. MANCHESTER: 45s. f.o.b., East Coast.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10¼d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The prices have been announced for the remainder of the fertiliser year 1935/36 as follows: February, £7 3s. 6d. per ton; March to June, £7 5s., for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to former's nearest station.

CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: February, £7 2s. 6d. per ton; March, £7 3s. 9d.; April/June, £7 5s., delivered in 4-ton lots.

NITRO-*C*:ALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to anlysis, delivered in 6-ton lots to farmer's nearest station.

Wood Distillation Products

ACETATE OF LIME.—*Brown*, £7 15s. to £8 15s. per ton; grey, £10 10s. to £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey £11 10s.

CHARCOAL.—£4 15s. to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £43 to £46 per ton.

WOOD CREOSOTE.—Unrefined, 3d. to 1s. 3d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.

WOOD TAR.—£2 to £2 10s. per ton.

Latest Oil Prices

LONDON, Jan. 29.—LINSEED OIL was easy. Spot, £29 10s. per ton (small quantities); February, £26 17s. 6d.; March-April, £27 2s. 6d.; May-Aug., £27 5s.; Sept.-Dec., £27 10s., naked. SOYA BEAN OIL was lower. Oriental (bulk), January shipment, £22 10s. per ton. RAPE OIL was inactive. Crude, extracted, £35 10s. per ton; technical, refined, £37, naked, ex wharf. COTTON OIL was quiet. Egyptian, crude, £25 10s. per ton; refined common edible, £29; and deodorised, £31, naked, ex mill (small lots £1 10s. extra). TURPENTINE was unchanged. American, spot, 44s. 3d. per cwt.

HULL.—LINSEED OIL.—Spot quoted £27 10s. per ton; Jan., £27 2s. 6d.; Jan.-April, £27 5s.; and May-Aug., £27 7s. 6d. COTTON OIL.—Egyptian, crude, spot, £25 10s. per ton; edible refined, spot, £28 10s.; technical, spot, £28 10s.; deodorised, £30 10s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £26 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £31 10s. per ton; deodorised, £34 10s. RAPE OIL.—Extracted, spot, £34 10s. per ton; refined, £36. SOYA OIL.—Extracted, spot, £27 per ton; deodorised, £30. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. CASTOR OIL.—Pharmaceutical, 42s. 6d. per cwt.; first, 37s. 6d.; second, 35s. 6d. TURPENTINE.—American, spot, 45s. 3d. per cwt.

Books Received

Solubility of Non-Electrolytes. By Joel H. Hildebrand. New York: Reinhold Publishing Corporation. Pp. 200. 22s. 6d.

The Chemistry of Milk. By W. L. Davies. London: Chapman & Hall, Ltd. Pp. 522. 25s.

Business Man's Guide to Management, 1936. By G. E. Milward. London: Management Library. Pp. 105. 3s.

Forthcoming Events

LONDON

Feb. 3.—Society of Chemical Industry (London Section). Joint meeting with the Plastics Group. "Some Aspects of Adhesion." Dr. A. R. Lee. 8 p.m. Burlington House, Piccadilly, London.

Feb. 5.—Society of Public Analysts. Joint meeting with Food Group, the Society of Chemical Industry. Discussion on tea and Coffee, with special reference to their Tannins and Alkaloid. The Constitution of Tannins, including those of Tea and Coffee, Peter Maitland; A Survey of the Methods of Analysis for Tannins, C. Ainsworth Mitchell; Experimental Work on Tea Tannin, M. Nierenstein; The Pharmacology of Caffeine, and of Tea and Coffee, G. Roche Lynch; The Tannins in Tea, P. J. Norman and E. B. Hughes; Coffee Essences, E. Hinks; A Note on "Tanninless" Teas, by H. H. Bagnall. 5 p.m. to 6.45 p.m., and 8.15 p.m. to 10 p.m. Burlington House, Piccadilly, London.

Feb. 6.—Institute of Metals (London Section). "The Applications of Metals in Chemical Engineering." H. W. Cremer. 7.30 p.m. 83 Pall Mall, London, S.W.1.

Feb. 6.—The Chemical Society. Ordinary scientific meeting. 8 p.m. Burlington House, Piccadilly, London.

Feb. 7.—Society of Dyers and Colourists (London Section). "Notes on Dry Cleaning." C. L. Bird.

BANGOR

Feb. 7.—The Chemical Society. "Ergot and Ergotism." Professor G. Barger. 8 p.m. University College, Bangor, North Wales.

BIRMINGHAM

Feb. 4.—Electrodepositors' Technical Society. "Protective Finishes for Zinc." Dr. P. S. Lewis. 7.30 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

Feb. 6.—Society of Chemical Industry (Birmingham and Midland Section). Joint meeting with the Refractories Association of Great Britain. "Refractories Technology: Twenty-five Years' Retrospect." W. J. Rees. 7.30 p.m. University Buildings, Edmund Street, Birmingham.

BRISTOL

Feb. 6.—Institute of Fuel (Bristol Section). Joint meeting with the Society of Chemical Industry. "The Technique of Hydrogenation of Coal and its Products." Dr. J. G. King. 7.30 p.m. University Chemical Department, Woodland Road, Bristol.

GLASGOW

Feb. 6.—Society of Chemical Industry (Glasgow Section). Thomas Hawksley Lecture. "Muscles and Nerves, Postures and Communications of the Body." Professor A. V. Hill. 7.30 p.m. Royal Technical College, Glasgow.

Feb. 7.—The Chemical Society. "Some Recent Developments in Surface Action." Professor E. K. Rideal. 7.30 p.m. Royal Technical College, Glasgow.

LIVERPOOL

Feb. 6.—British Association of Chemists (Liverpool Section). Supper and Social Evening. 7.15 p.m. Angel Hotel, Liverpool.

Feb. 7.—The Chemical Society. "The Play of the Molecules in a Simple Chemical Reaction." Professor H. M. Dawson. 6 p.m. Chemistry Lecture Theatre, University, Liverpool.

MANCHESTER

Feb. 4.—The Chemical Society. Joint meeting with the University of Manchester Chemical Society. "The Structure of Benzene." Professor C. K. Ingold. 4.30 p.m. Chemistry Lecture Theatre, University, Manchester.

Feb. 5.—Manchester Metallurgical Society. "Trends of Metallurgical Developments." Major F. A. Freeth. 7 p.m. Engineers' Club, Albert Square, Manchester.

Feb. 6.—The Institute of Vitreous Enamellers (Northern Section). "Refractories for Enamelling Muffle Furnaces." John Walker. 7.30 p.m. Y.M.C.A., Peter Street, Manchester.

Feb. 7.—Institute of Chemistry (Manchester Section). Joint meeting with the Society of Chemical Industry and the Institution of the Rubber Industry. "Patents as Industrial Property." W. A. Silvester. 17 Albert Square, Manchester.

NEWCASTLE-ON-TYNE

Feb. 7.—Society of Chemical Industry (Newcastle Section). "The Chemist's Job in a Modern Power Station." G. W. Hewson. 7.30 p.m. Armstrong College, Newcastle-on-Tyne.

Feb. 5.—Institute of Chemistry (Newcastle Section). "Studies in Metallic Corrosion." Dr. W. S. Patterson. Sunderland Technical College.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

D. AND L. MANUFACTURING CO., LTD., Western Road, Plaistow, chemical manufacturers. (C.C., 1/2/36.) £22 13s. 6d. Dec. 10.

Bankruptcy Proceedings

SOLOMIDES, Zenon Ioannou (described in the receiving order as Z. Solomides), 30 Connaught Avenue, East Sheen, S.W.14, chemical manufacturer.—The first meeting of creditors was held at 29 Russell Square, London, on January 24. The statement of affairs filed showed ranking liabilities of £2,372, and there were no assets. Debtor attributed his failure to insufficient profits to cover both overhead and household and personal expenses, decline of trade, and loss of £140 in respect of an order which did not materialise, and bad debts. The case being a summary one was left in the hands of the Official Receiver, as trustee.

Company News

South Metropolitan Gas Co.—A final dividend is announced, subject to audit, on the £6,709,895 of ordinary stock of 3¼ per cent., making 5¾ per cent. for the year to December 31 last. In 1934 shareholders received a similar distribution, against 6 per cent. in the three preceding years.

Benn Brothers, Ltd.—The directors of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE and other trade and technical journals, have declared the usual dividends, less tax, payable on February 15, namely, 3 per cent. on the preference shares for the half-year to December 31, and interim dividends of 5 per cent. on the ordinary shares, and 1s. per share on the deferred shares.

Southalls (Birmingham), (formerly Southall Bros. and Barclay).—A net profit of £84,378 is reported in 1935, compared with £83,360 in the previous twelve months. The final dividend is 10 per cent., making 20 per cent., tax free. A similar rate was paid a year ago, when shareholders also received a 10 per cent. distribution from profit on the sale of investments. The directors also propose to distribute a scrip bonus at the rate of one 5s. ordinary for every five held, a sum of £39,000 being appropriated from the company's internal reserve fund for this purpose. A capital bonus of 25 per cent. was distributed for 1933. After transferring £45,000, against £40,000, to reserve, the carry forward is slightly higher at £22,491.

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